

INDUSTRIAL-ARTS MAGAZINE

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Published Monthly by

THE BRUCE PUBLISHING COMPANY, Milwaukee, Wis.

Established 1891

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H. KASTEN, Subscription Manager

OFFICES

MILWAUKEE: 129 MICHIGAN ST.

New York: 112 East 19th St.

Chicago: 64 W. Randolph St.

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The subscription price of the *Magazine* is \$1.50 per year, payable in advance. Postage for Canadian and Mexican subscriptions, 35 cents; for foreign countries, 50 cents. Single copies, not over six months old, 25 cents; more than six months old, 50 cents. Notice for discontinuance of subscriptions must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration, with full balance due to date. Notices for changes of address should invariably include the old as well as the new form of address. Complaints of non-receipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

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The Board of Editors invites contributions of all kinds bearing upon the Industrial-Arts Education, Manual Training, Art Instruction, Domestic Science, and related subjects. Unless otherwise arranged for, manuscripts, drawings, projects, news articles, etc., should be sent to the Publication Office in Milwaukee, where proper disposition will be made. The Board of Editors meets once or oftener each month in Chicago, and all contributions submitted are given careful attention. Contributions when accepted are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

The Industrial-Arts Magazine is on sale at Brentano's, 5th Ave. and 27th St., New York City; John Wanamaker, Market St., Philadelphia; A. C. McClurg & Co., 218 S. Wabash Ave., Chicago.

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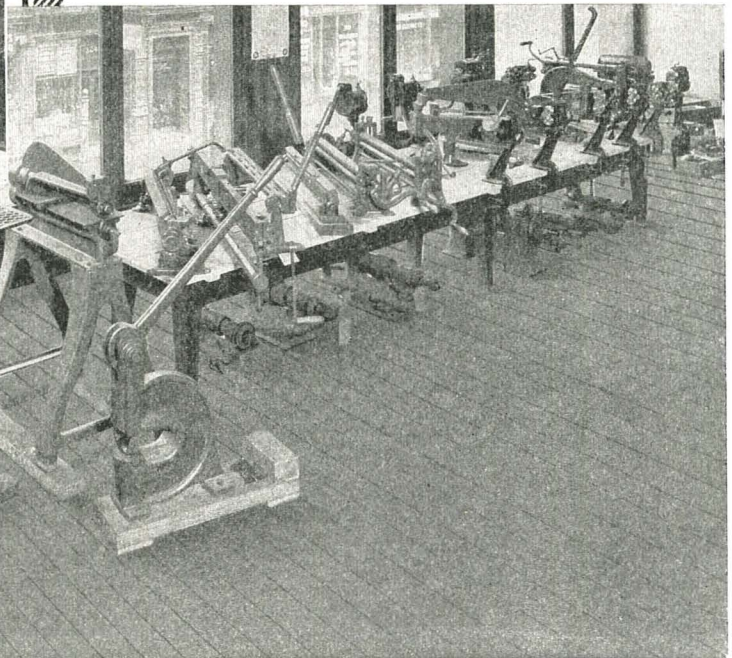
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Diversified Industrial Activities as a Means of Educational and Vocational Guidance for Seventh, Eighth, and Ninth Year Boys

A. H. Edgerton, Lincoln School, Teachers' College, New York City

STUDIES, INVESTIGATIONS AND EXPERIMENTS.

O those who have observed the extremely slow but certain reorganization of industrial education in the upper grades of our public schools, it must be evident that tradition, rather than present day need, has too largely determined the purpose, content, and method of the industrial subjects. In spite of the fact that it has long been agreed that, if possible, children should be kept in school until they are so prepared that they may find suitable employment as a result of their own initiative, the traditional curricula have, with few exceptions, failed to furnish those real life experiences which would help to make this possibility a reality. Altho recent, the rapid development of intermediate schools, junior high schools, and experimental work in other schools gives great promise that all children may soon have an opportunity to find out what they would like to do as well as what they are best able to do, before leaving school.

In the case of boys, it is true that shopwork has for some time been taught in the majority of our seventh, eighth, and ninth years; however, this shopwork has too often been confined to work in wood only. Even tho such a course properly represents the divisions in the woodworking industry and is excellent in every particular, it is obvious that it can only provide opportunities for boys to discover their interests and abilities, both in positive and negative ways, in terms of a limited phase of industrial activity. Not only is this plan of over-emphasizing a comparatively small part of industry narrow, in that it only makes discovery and development possible in a limited field, but it is also extremely wasteful of the pupils' time.

Then, too, it is still not uncommon for boys in these years to be required to make series of exercises, models, pieces, or whatever you may care to call them, receiving a large amount of technique in the use of tools but learning little else of real value. As this kind of a course is planned for a group of boys, all of whom are expected to work upon practically the same thing at the same time, the experience which they receive in the school shop almost completely fails to appeal to their individual interests and capacities. The most dangerous form of this, as far as the best interests of the boys are concerned, is where they do their work in a certain prescribed way

because the instructor has told them to do so, allowing them no opportunity to think out and make definite plans to meet the difficulties of problems at hand. Unfortunately, not a few instructors are even now being judged as successes or failures by the quantity and quality of the pupils' work which they are able to display at the annual school exhibition. Where the finished product is thus given so much emphasis, one can not help wondering whether those responsible are not chiefly concerned with the making of things rather than with the development of their boys.

Present Tendencies in Industrial Arts for Seventh, Eighth and Ninth Year Boys.

In much of our upper grade curricula, the time allowed for information and shopwork is quite limited. Nevertheless, some teachers are covering several fields of industry in order that their pupils may have a more complete understanding of industry and likewise be better prepared to make an intelligent choice, when that time comes. Some have had the courage to consider the school shop as a laboratory where boys may investigate various important industries. As a result of these studies, which are unlimited in possibilities, boys are brought in contact with materials, tools, machines, processes of manipulation, and worth while information concerning the work and the workers in each industry represented.

Today, there is a growing realization of the importance of so representing, organizing, and offering a variety of industrial activities and related studies that they will make no small contribution to the vocational guidance of seventh, eighth, and ninth year boys. Altho vocational guidance does not here mean the finding of jobs or employment for boys, it is believed that a variety of tasks or experiences may be so based upon various industrial pursuits as to help in the selection of their life work, and often in the beginning of their preparation for this. That is, all boys should be given enough freedom in choice and variety of industrial experiences to completely try-out interests and thoroly test capacities for industrial work. Even tho some are not adapted to industrial work, it is desirable that all boys have an appreciation of economic production and the proper attitude toward work and workers, regardless of what their life work may ultimately be.

In order to accomplish these ends most effective-

ly, the various shop activities represented should be based upon and, as far as is possible and practicable, truly representative of the industries. In this connection, Dr. Dewey has written, "Select the materials and the technique of the trades not for the sake of producing skilled workers for hire in definite trades, but for the sake of securing industrial intelligence, a knowledge of the conditions and processes of present manufacturing, transportation, and commerce so that the individual may be able to make his choices and his own adjustments, and be master, so far as in him lies, of his own economic fate."* It is thus possible to give boys an acquaintance with conditions in the workaday world in relation to future occupations, thru actual contact with several distinct lines of industrial work.

The Great Need for Guidance at This Period.

In questioning a large number of industrial workers relative to how and why they entered their respective occupations, one is forced to conclude that there is more truth than fiction in the statement that, in the majority of cases, entrance into industrial life is the result of blind rather than intelligent choice. While in the Canal Zone, Panama, I was forced to realize this fact, as never before, as the result of personal interviews with 157 skilled workmen. These foremen and first-class mechanics were either personally interested in or had been detailed for certain responsibility with boys serving their apprenticeships as machinists, blacksmiths, boilermakers, molders, pipefitters, plumbers, sheetmetal workers, carpenters and joiners, cabinet-makers, patternmakers, and electricians. The information resulting from this investigation concerning the vocational guidance processes which had caused these 157 highly-skilled workers to select the trades at which they were then working, is briefly as follows:

Twenty-nine had received their vocational training in Europe, consequently their trades were chosen for rather than by them.

One had worked at nine different jobs before choosing his present trade.

Two had worked at eight different jobs before choosing their present trades.

Six had worked at seven different jobs before choosing their present trades.

Eight had worked at five or six different jobs before choosing their present trades.

Thirteen had worked at four different jobs before choosing their present trades.

Thirty-four had worked at two or three different jobs before choosing their present trades.

Thirty-three had worked only at their present trades, but they had had no particular basis for choosing their respective work (those who gave any reasons said that they had chosen it because their parents wished them to, because they were tired of going to school and were willing to take any work that seemed

to offer good opportunity, because they admired someone doing that work, etc.).

Fourteen frankly admitted that, altho they liked their present trades, they felt quite certain that they would have succeeded equally well, if not better, at other work had they had a try-out period at the outset.

Seventeen were satisfied that the variety of work which they had had during their training, either in apprentice departments, technical schools, or colleges, was sufficient to make their first choices intelligent ones.

As these 157 skilled workers represented some of the most successful of 3,911 employees, a large percentage of whom were not highly skilled, it is reasonable to believe that industrial workers ordinarily receive no better opportunities for vocational guidance than did these men.

It is not difficult in any city to find many boys of secondary-school age who have had from four to eight jobs during two years of working experience, most of which has offered little that will help them to wisely choose their life work. At its very best, considering that work has been selected in an occupation which seems to offer good opportunities, the determining factor of a boy's success usually depends upon whether or not he makes good and likes it well enough to continue. As a result of such a hit-or-miss choice, it is no wonder that so large a percentage of boys (as high as 90 per cent in some plants) fail in one job after another until they finally manage to succeed sufficiently well to remain in one. Such a method of trial and error cannot be otherwise than extremely wasteful to all concerned. Altho it often actually tries boys out to varying degrees in several vocations, it requires that they must either make a failure or become dissatisfied with one job before they can be tried out in another. In the case of a failure, it is quite possible that the loss of confidence, which boys at this age often experience, does not have the best effect upon their attitudes toward other work. On

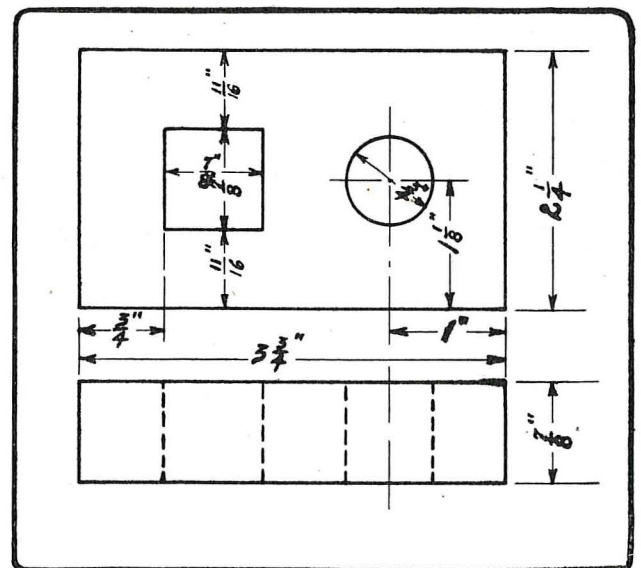


Fig. 1. Working Drawing of Fitting Block. Made as described during the experiment.

*Dewey, John. "Learning to Earn." School and Society Magazine, March 24, 1917.

the other hand, the fact that boys do like and succeed in the work of their first choices is by no means an assurance that they have chosen the respective occupations for which they are best suited, since the basis of comparison, including their likes and dislikes as well as their abilities and inabilities for various work, upon which their judgments might be more soundly made are usually lacking.

At any rate, this plan either completely fails to give a background of experience for making a choice or it succeeds in a fashion after a long drawn out process of elimination. Even tho it were possible for an inexperienced boy to make his own selection of an industry, which is seldomly true, he unquestionably lacks that variety of experience which would

but also needs to give first-hand information concerning the industry represented.

To be most worth while, such a course must be a study of real, productive industries rather than a formal, textbook acquaintance. In fact, there are but few kinds of raw materials, and comparatively few principles involved in their manufacture. The number of great type industries and their important processes of production are also surprisingly small, all of which suggests that the related studies, as well as the actual shopwork, might well follow these type activities and widely significant operations somewhat intensively. In addition to studies of general industrial conditions, group excursions to local plants and constructions and investigations of the industries



Fig. 2. Main Aisle of Foundry at Balboa, Canal Zone. Photographed by Artificial Illumination at Night.

help him to choose his life work intelligently. Is it not then the duty of our public schools to give boys that fundamental knowledge and experience of the important industries before they leave, in order that they may be helped to a wiser decision of what their life work might well be?

Problems in the Selection and Organization of Industrial Activities and Related Studies.

The primary need for the majority of boys, especially during their seventh and eighth years, is not so much for a high degree of manipulative skill, altho an acquaintance with materials and processes of construction is always valuable, as it is for reliable information with which to judge the industries. Whether the activity at hand be that of printing, drawing and design, electrical construction, carpentry, cabinet-making, patternmaking, molding and casting, forging, machine construction, sheetmetal work, concrete construction, or a combination of two or more of these, it should not only include contact with typical materials, tools, machines, processes of manipulation, and well organized shopwork

as to wages, needs, and opportunities give information which will help in forming sound judgments regarding the character and possibilities of occupations, as well as to demand more respect for industrial workers and their work. As the occasion requires it, each boy should be brought in touch with reliable reading matter, charts of industry, unbiased specialists, or whatever sources of information seem best suited to the case in question. A simple but effective "vocational index" may be used to record the inferences of teachers and others based upon activities carried on inside and outside of school, both during the attendance and follow-up periods. With the help of such other closely related subjects as elementary science, history, geography, mathematics and English, it would be possible to offer a rich study of the larger economic aspects of industry during these years.

While these diversified courses will undoubtedly begin the preparation of lifework for many boys, it should certainly not be assumed that all boys taking industrial arts will go into the industries. If properly organized and offered, such a scheme of industrial

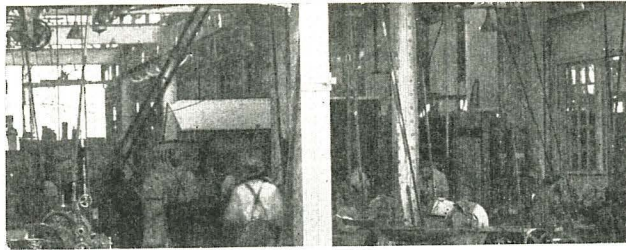


Fig. 4. Interior of the Machine Shop Tool Room where several of the Boys mentioned in the article began their Apprenticeships.

education should be liberal enough to help those who can continue their school work to more wisely choose their courses in higher education, and likewise help those who find it necessary to leave school with a minimum amount of education to choose their respective occupations more intelligently. It is, therefore, desirable to have the work cover a reasonably wide range of industries and industrial processes, in order that boys may have a rich and varied experience upon which to draw. Thruout the course, the aim should be to emphasize fundamentals and to give a good foundation rather than special training. Provided it becomes necessary for a boy to prepare for a vocation, an activity may be so extended as to become a prevocational course which will point more directly toward the occupation to be chosen at the end of his schooling, if such a choice can be made. Because of the general purpose of the upper grade work, this special adaptation should be considered as "semi-specialization" rather than as strictly vocational training. Wherever vocational schools or co-operative courses exist, it may prove more satisfactory to carry on as little as possible of the additional productive work in this shop. At any rate, industrial plants should be visited, first-hand information regarding the industries should be available, and the existing relation between the school activity and the industry represented should be made unquestionably clear. That is, for example, whenever the equipment in the school shop will not allow boys to do their work in the most practical way, it should be clearly explained how this would be taken up in the industry and that their work is being done in as practical a manner as possible with the necessarily limited equipment.

If the city or town be one of mixed industries, as is decidedly true here in New York, there is even a greater need for industrial activities to serve a vocational guidance purpose during the seventh, eighth, and ninth years. The school must squarely meet the fact that a large number of boys will work in the industries anyway, even tho they are not properly guided in making their choices. When we consider the wide range of occupations at which boys are working, we are naturally surprised at the size of the problem. It is generally true in New York, for example, that boys are distributed in industrial pursuits in proportion to the total number of men distributed in each large industrial group. One can

readily see that it would be both impracticable and impossible for this school to represent so great a variety of highly specialized occupations as may be found for any city in the last Special Report of the United States Census. It is possible, however, to offer well-organized samplings of type activities, which will develop appreciation and understanding of the desirable modern industries without over-emphasizing the localized and undesirable occupations. As has already been explained somewhat in detail, such a varied industrial program is also the best basis for vocational guidance, as it allows all boys a chance to find, try out, and develop or discover a lack of interests and capacities in terms of the industries about them.

Possibilities for Discovering and Developing Various Tastes and Aptitudes.

Not many years ago, so-called phrenologists charged fees for feeling of bumps on people's skulls and supposedly telling them for what occupations they were fitted. Altho some promising psychological devices and tests have since been discovered for choosing persons for positions,† methods are still lacking by which to find out thru analysis just the kind of work for which boys are best fitted. At present, there is perhaps no easier or safer way to discover the individual's capacity for each type of industrial work represented in the school workshop than to actually observe the degree of his success and failure, as he works at each activity.

As Professor Bonser of Teachers College, Columbia University, has so clearly pointed out, activity may be used to reveal "facility in manipulation, potential skill in mechanical construction, creative ability in design, ability to organize and plan, and capacity for the leadership and management of other persons." Relative to the possibilities of varied experiences in the practical arts as a means of revealing vocational aptitudes, he has written, "Differentiations in interests and capacities will appear and be demonstrated as different fields of industry are developed. Those showing little skill in the use of hand tools may be strong in the understanding and manipulation of

† Ayres, Leonard P. "Psychological Tests in Vocational Guidance." Russell Sage Foundation Publication, April, 1913.

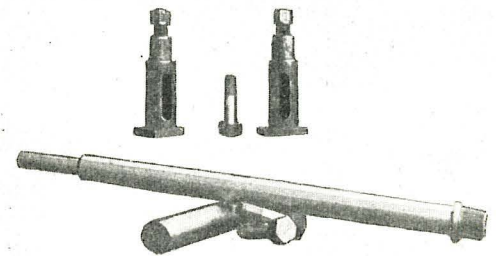


Fig. 5. Pieces in Machine Construction made by Apprentices during four Semi-Annual Examinations.

machines. Printing may appeal strongly and be done well by those not succeeding in woodworking and metalworking industries. Capacity for design may be strong where power of execution is weak. Each particular field as developed thru the years of school life will help to find its workers, and capacities revealed and interests developed, together with pertinent information accumulated, will almost of themselves result in an appropriate vocational selection by pupils when the time for selection arrives. Negatively as well as positively, this kind of study is valuable in eliminating the unfit from respective fields; the interests and attention of these may the more strongly be directed into other kinds of work and the trying-out process continued until the capacity of greatest promise is discovered."** Thus, thru actual participation in important industrial work, which every school might represent in terms of its own community, much can be done in discovering abilities for doing and managing industrial work. When tastes and aptitudes have once been even partially determined, they can be sufficiently tried out and developed as the work progresses. In this way, thru an organized process of testing and developing by means of industrial activities, individual interests, inclinations, and capacities are not only revealed but are continually checked and developed as the work increases in difficulty and the studies become more intensive.

Difficulties to Be Met in Giving Guidance and Direction.

Much of the criticism which has been directed toward the vocational guidance movement in this country, may be attributed to the increasing objection to having decisions forced upon young people by the larger experience of teachers and counsellors. Where is there an open-minded, con-

** Bonser, F. G. "The Curriculum as a Means of Revealing Vocational Aptitudes." *Education*, Nov., 1916, page 156.

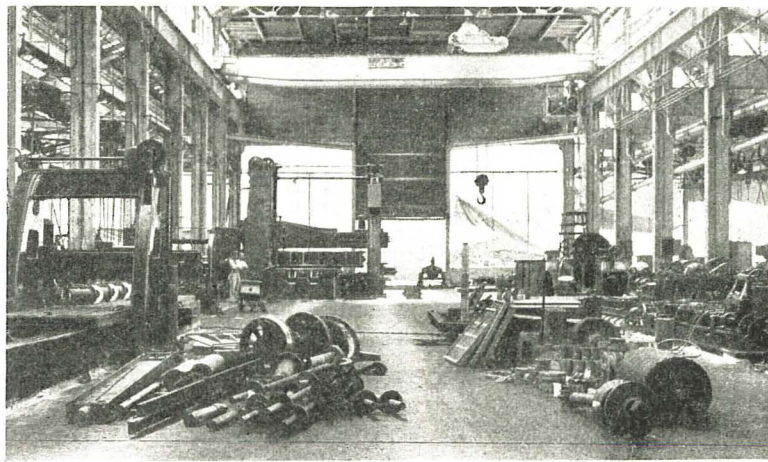


Fig. 6. Main Floor of the Balboa Machine Shop where five of the boys mentioned in the article learned their trades.

scientious industrial teacher who has not, time after time, hesitated in advising his students to become carpenters, draftsmen, or what not, even when there was little doubt in his mind as to the probability of their succeeding with the work in question? Altho the instructor may fully realize the need for vocational direction and guidance during this period, and the very nature of his position causes him to do much of both, nevertheless, the experienced teacher cannot help but know his limitations in this uncertain field, where many pitfalls are possible as the result of misdirection.

This great need for dealing intelligently with the problem of efficient choice, both as to self-expression and public service, suggests that, if possible, the decision might well come as a result of the boy's experience with industry and his understanding of economic facts and values. However, when needed, this should always be helped out by the counsel of those who are responsible for his guidance and direction, as previously suggested in this paper. It is far from satisfactory, especially during this critical try-out period, to estimate the worth of individual pupils in terms of percentages or other generalities. Thru a variety of experiences and a flexible program,

there should be found a direct means for discovering individual differences in the continuous observations of success and failure in each aspect of the work.

As the result of almost daily observation, I have been led to believe that, where elements are in common between two distinctly different kinds of work such as woodwork and metalwork, for example, those who do good work with woodworking tools also handle metalworking tools with about the same amount of accuracy. (This is to be considered as a comparative statement, of course, since a greater degree of accuracy is usually required in metalwork than in woodwork.) My attention was

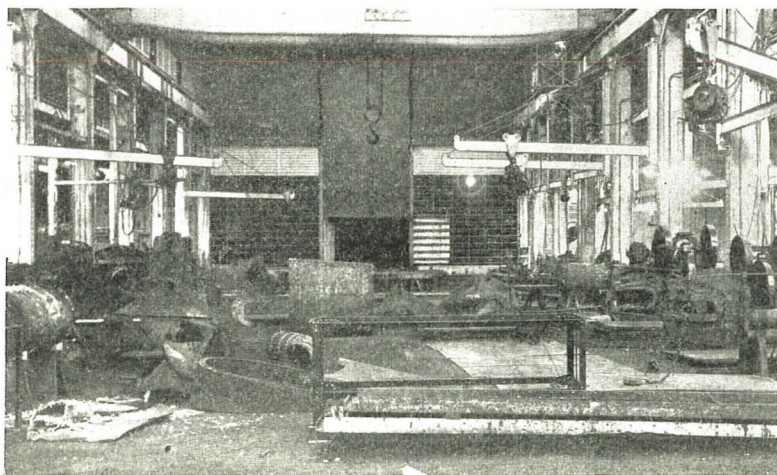


Fig. 7. One section of a Canal Zone Boiler Shop where Apprentice Work was done by three of the boys mentioned in the article.

frequently called to this matter, as boys whom we had considered especially workmanlike while in carpentry and joinery, cabinet-making, or patternmaking had repeatedly entered forging, bench-metal, or machine construction classes, where they had proven equally well adapted to that work. Furthermore, it has several times come to my attention that the boys who were able to do the fine and most exacting hand-work, especially in the machine shop, were likewise those who had been doing the most accurate work in the mechanical drawing room. Judging from the evidence which has accumulated, it seems more and more probable that those boys who use hand tools in a systematic and workmanlike manner on a number of jobs in one field of industry, can also do tasks of equal difficulty in other fields with about the same facility, provided other conditions are equal.

Experimenting With Related Vocational Ability.

Having recently opened an apprentice school, where boys learning various trades in the Canal Zone shops might meet for two four-hour periods each week and still receive full-time wages, an opportunity was offered for us to try out the above inferences upon several boys who were just beginning their apprenticeships. The 24 boys with whom the experiment was made were serving their respective apprenticeships as follows:

Trade	No.	Trade	No.
Machinists.....	8	Cabinet-makers.....	2
Boilermakers.....	4	Molders.....	2
Pipefitters.....	4	Sheetmetal worker.....	1
Blacksmiths.....	2	Carpenter.....	1

All excepting four of these boys had left school during their seventh, eighth, or ninth years and ranged in age from 12 to 17 years. Fourteen of the 24 had worked at unskilled jobs (from one to four) before starting to learn trades.

During either the latter part of the second or the early part of the third month of apprenticeship, it seemed desirable to have each boy make a first-hand study of a simple product, developing it from the drawing to the finished piece, in order that he might have a more intelligent understanding of the necessary steps in transforming pig iron into a finished product. Each boy, regardless of his trade, was, therefore, first required to make a working drawing of the simple fitting block shown in Fig. I. From these, each later made a wooden pattern to be molded in the foundry, the main aisle of which is shown in Fig. II. None of these boys had had less than 28 hours or more than 36 hours of mechanical drawing when this problem was taken up, consequently a fair judgment of each boy's ability to use drawing instruments was easily had, since all knew that we intended to keep these drawings as samples of the quality of work they were able to do at that time.

The stock to be used for this problem in pattern-making had been cut out nearly to size, allowing only

enough on each dimension to plane off a few shavings before laying out the required draft on the piece. As none of these boys had previously used a block-plane, I demonstrated its uses to all before starting them on their patterns. Not only did I show them the correct method of blockplaning but also planed across the end in the improper way, purposely splitting and spoiling the piece which I had just been particular to carefully finish. Likewise when they were ready for chiseling, the correct method was first demonstrated, after which I chiseled straight thru and once more split the piece after having practically finished it. These parts of the demonstration, dealing with the incorrect uses of tools, were given primarily for the purpose of having the boys thoroly realize the possible difficulties which their work might offer, provided they did not use the tools correctly. When boys are thus shown the trouble which may be avoided or actually experienced, as a result of using tools correctly or incorrectly, there are few who do not take great care to save themselves an unnecessary waste of time.††

The making of these patterns enabled us to estimate each individual's ability to use hand tools for comparatively fine work in wood. These tentative judgments, ranking from systematic to un-systematic and from workmanlike to unworkmanlike, were recorded with those conclusions reached as a result of the observations of each boy's use of drafting instruments.

As all apprentices were required to spend the first three months becoming familiar with general shop conditions and shop tools, including the methods of issuing and accounting for these, the foreman of each shop concerned sent me a monthly report for each apprentice on the special form shown in Fig. III. In addition to this general information, each mechanic who was directly responsible for one or more apprentices gave me a detailed estimation of what he believed to be each boy's worth. These judgments were given solely as results of observing boys as they handled and accounted for tools during their first three months of service. Fig. IV shows the interior of one of the tool rooms, where four of these ap-

†† For details of experiments showing these results see "Experimental Work in the School Shop as a Means of Industrial Efficiency." *Industrial-Arts Magazine*, April, 1915, page 162.

THE PANAMA CANAL CANAL ZONE PUBLIC SCHOOLS APPRENTICE CARD

Name.....Shop.....Date.....

Nature of Work.....

Length of Job.....

Is he interested?.....

Is he industrious?.....

Does he benefit by his mistakes?.....

In what does he excel?.....

In what does he show weakness?.....

Give any other information or suggestions to help the instructors give the boy that which he needs most.

Foreman.

Fig. 3.

prentice-machinists were learning methods of issuing and accounting for shop tools.

A comparison was then made between the judgments reached in the school shop, after a short observation, and the conclusions which were drawn in the trades at the end of the first three months. Without an exception, the general opinions formed as a result of the making of one mechanical drawing and one wooden pattern by each boy agreed with those given by the first-class mechanics. From both sources, it was predicted that while seventeen of the boys showed promise of becoming good mechanics of varying capacities, the other seven offered little promise of even becoming fair mechanics. With two possible exceptions, in which cases the boys seemed to be both mentally and physically lazy, these seven boys completely failed to show aptitudes for handling tools. Few of them even benefited by their obvious

In order to determine the progress and proficiency of all apprentices, each one was examined semi-annually, dating from the beginning of his service. In addition to the questions asked along ordinary educational lines and on trade subjects, a portion of each examination consisted of the performance, unaided, of a job of work suitable for the length of time which the apprentice had been employed. Fig. V shows a few pieces of varying difficulty, which were made by machinist apprentices during these semi-annual examinations. The committee for the examination of each apprentice was composed of one foreman, one first-class mechanic, and the supervisor of apprentices. Fig. VI, Fig. VII, and Fig. VIII give an idea of some of the productive work in which boys apprenticed as machinists, boilermakers, and cabinet-makers took part, depending, of course, upon the length of their service and the

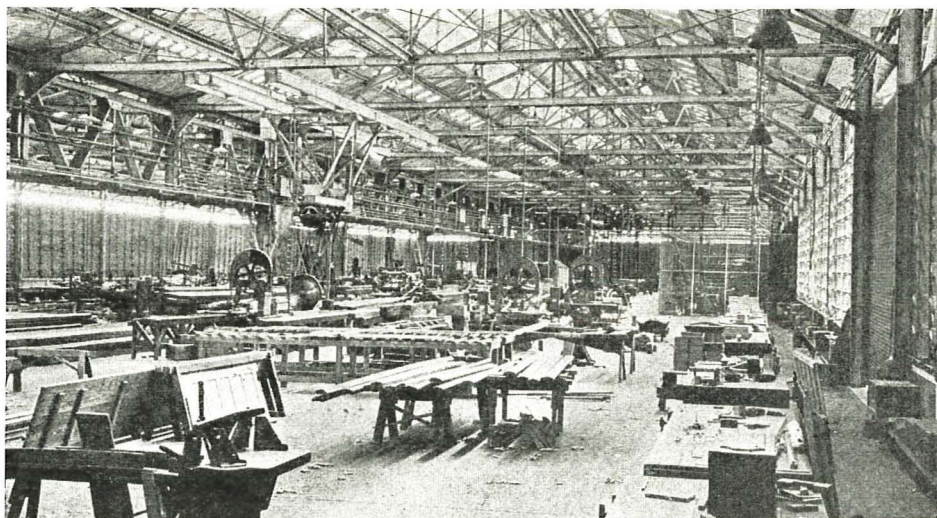


Fig. 8. Interior of Balboa Wood Shop, showing the Cabinet-Making Section in the Foreground.

mistakes. In this comparison of judgments, the only noticeable difference between the shop and school records was relative to three of the seventeen boys, whom all of us expected to succeed in the trades of their choices. The shops had reported that three of these apprentices (one machinist, one pipefitter, and one blacksmith), altho having the necessary ability to do their respective work, were not as industrious as they should have been. Our short observations had failed to detect this lack of industriousness on the part of the three boys, which may have been due to the fact that they were conscious of being judged by the work they were doing for us. At any rate, it was extremely interesting to find that our quick judgments of the individual ability of 24 boys to use hand tools in drafting and woodwork practically coincided with the estimations given by sixteen mechanics, representing eight different trades. The accuracy of our conclusions could only be determined after an elapse of time long enough for these boys to actually try out their respective abilities.

initiative they had shown in connection with the work assigned, as outlined in the schedule of instruction for each trade. This productive work, done during the six-month period, quite largely determined the nature of the job chosen by the committee for each semi-annual examination.

As a result of the first semi-annual examinations, which took place approximately three months after the tentative judgments were recorded, five of the seven apprentices, previously mentioned as not showing promise as mechanics, were found to be deficient in their work. The other two, whom we had thought too lazy to succeed, had taken unexpected interest in the meantime and were doing well in their trades. Of the five boys who showed a lack of capability in connection with their chosen trades, one returned to school and the other four were advised to take up work not requiring mechanical ability.

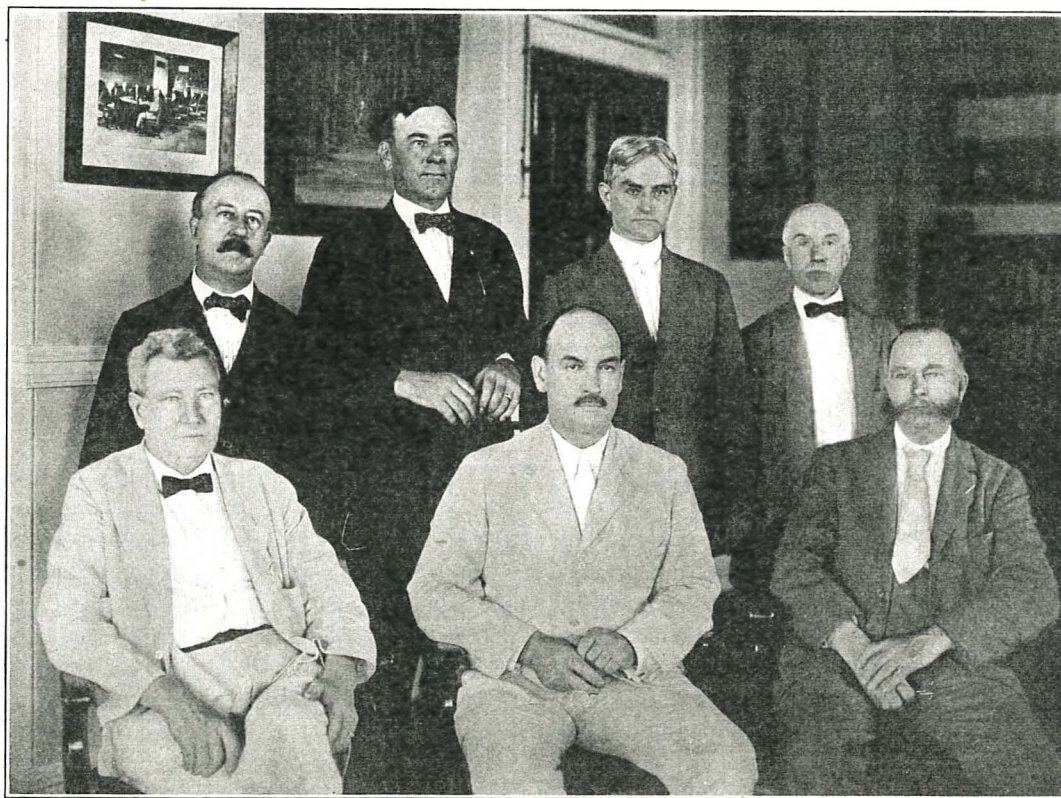
With the exception of the two cases where the boys' attitudes toward their work changed completely from apparent laziness to unquestionable industrious-

ness, the tentative judgments which were made by the mechanics and instructors, regarding the ability of these 24 apprentices to use hand tools, were verified by the results of the thoro semi-annual examinations. It was discovered, beyond a doubt, that those who were most systematic and workmanlike in the making of a drawing and a wooden pattern with hand tools were likewise most successful during their first six months in the machine shop, boiler shop, pipe and sheetmetal shop, blacksmith shop, foundry, or woodshop, where they issued, accounted for, and used hand tools. While this experiment with only 24 boys does not conclusively prove anything, the fact that it involved several people, whose individual judgments were practically identical, strongly suggests that estimations made by those who understand boys and industrial work, whether instructors or mechanics, do not differ very widely.

This experiment, altho necessarily limited in scope because of the nature of the work and the time available, showed great need for so representing a wide range of industries and industrial processes that the work may be well adapted to the interests, inclinations, and capacities of boys for some time before they leave the upper grades of the elementary school. Nor is it enough to merely represent such a variety of industrial activities as has already been mentioned. It is fully as important that an allowance be made for

freedom in choice and experimentation in connection with this work, in order that all boys may have an opportunity to discover the value of their talent, both in negative and positive ways, and, in the latter case, give them a chance to develop it.

All of this does not mean that an instructor of shopwork should consider his judgment sufficient to arbitrarily choose certain occupations for boys, because they have shown special aptitude for certain kinds of work. On the other hand, his unbiased judgment will often prove to be of no small value in helping individual boys to find themselves. Not only will he make it possible for boys to try out, discover, and develop any ability for doing and managing industrial work, but he will also bring boys in contact with charts of industry, reliable reading matter, unbiased specialists, and other sources of information, as the particular case may require. He will thoroly appreciate that there is no part of the vocational guidance procedure more important than this of coming to a wise judgment as to the existing conditions in an industry, its comparative permanency, and its general wholesomeness. Where boys are compelled to leave school during these years, a greater amount of productive work should be given for the purpose of helping them in the particular work chosen; however, if possible, all should be kept in school until they have some foundation for their life work.



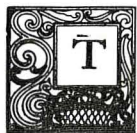
THE NEW FEDERAL BOARD OF VOCATIONAL EDUCATION.

The Board will administer the law providing for federal cooperation with the states in establishing and maintaining vocational, continuation and agricultural schools. About \$1,500,000 will be expended the first year.

Standing (left to right) A. E. Holder, Chas. A. Greathouse, P. P. Claxton, James P. Munroe. Sitting (left to right) Wm. B. Wilson, Secretary of Labor, David F. Houston, Secretary of Agriculture, (Chairman) Wm. C. Redfield, Secretary of Commerce.

MODERN SIGN PAINTING AND THE RUDIMENTS OF FREEHAND LETTERING

Walter A. Heberling of Mooseheart Vocational Institute, Mooseheart, Ill.



THE principal craftsmen making use of lettering are the mason, the engraver, the penman and illuminator, and the sign painter.

There are two reasons why conditions have favored greater development in letter formation in sign painting than in the other crafts. The mason works with a chisel and mallet, the engraver with a steel tool and the manuscript writer with a pen. All of these tools are much more restricted in their capacity of expression than the pencil and brush of the sign painter.

No more subtle instrument exists, than the sable or camel's hair pencil in the hand of an adept craftsman and there is no more expressive medium to work with than the artist's colors.

The sign painter is offered an endless range and it is to his credit that he has made good use of his opportunities. It may safely be said that the sign painter has done more than any other to stress the importance of spacing, massing and the laying out of lettering in general and composition may also be honestly added.

It has been only within recent years that hand lettered advertisements appeared in magazines or on the bulletin boards seen on all highways of travel. Turn to the advertising section of any representative magazine and you will behold that the vast majority of the advertisements are the products of an artist's brush and that they have the individual and dignified appearance not attained with type.

Bulletin boards carrying either painted display or posters are also a monument to the ever increasing demand for hand lettering.

Type vs. Hand Lettering.

When Gutenberg invented movable types, he copied the hand lettering of the fifteenth century as nearly as possible, for he sought to displace the hand made book. He failed; booklovers spurned his product because its pages looked stiff, his letters were not on familiar terms with each other and a mechanical sameness pervaded the pages. The ascending strokes looked as tho they were pounded down with a mallet and there were no beautiful swash lines to relieve the monotony.

Since the day of the early printers the utilitarian side of printing has been largely uppermost. People wanted knowledge.

After a time the artists came over to the printer, who was progressive and had good money to pay, for the illumination and decoration of books just as the artists of today are giving their best efforts to commercialism that is progressive.

When process engraving was invented, the artist and designer were quick to seize upon the oppor-

tunities offered for covers, headlines, initials and trademarks which were reproduced in fac-simile quickly and cheaply.

Hand lettering is flexible; you can stick it around just where you want it, make the characters snuggle up together, join hands, link arms, look over one another's shoulders, make love and mingle together in harmony.

In type set letters you cannot make them do all these friendly stunts, as each individual must stay on his own premises because he is part of the premises and his lot is cast there. The graceful "g" must keep his tail curled under him and the poor old "Q" must not allow his curly appendage to protrude upon brother "U's" domain. The fastidious advertiser has long since abandoned type for display lines for the good reason that it is so monotonously mechanical and unattractive. So much for history.

A Lettering Alphabet.

Now let us look at the alphabet shown in Fig. I. You will notice that the alphabet is lettered on horizontal and vertical lines, forming squares which are called major fifths and a normal letter occupies five in height and five in width. These squares may be subdivided into 25 parts which would be called minor fifths. This system should be used only in an elementary way and the use of it should be discontinued after the aspirant has acquired a fair idea of the individual shape of each letter and can analyze them, and unless the system is then discarded the initial quality of freehand lettering will have been lost and the dependence on mechanical assistance tends to impart stiffness to the product.

The letter "A" should be one-fifth wider than a normal space (five-fifths high and the same in width is a normal space), "B" is normal, "C" is normal, "D" is normal, "E" is one-half of one-fifth less than normal, "F" is the same as "E" and "G" is normal, "H" is one-fourth of one-fifth less than normal, "I" is just the width of the letter stroke being used, "J" is one-fifth less than normal, "K" is a trifle wider than normal at the bottom, "L" is one-fifth less than normal, "M" is one-fifth wider than normal, "N" is one-half of one-fifth less than normal, "O" is one-half of one-fifth wider than normal, "P" is normal, "Q" is the same as "O," "R" is normal, "S" is a trifle wider at the bottom than normal, "T" is, in this particular alphabet, one-half of one-fifth less in width, "U" is one-fourth of one-fifth less than normal, "V" is one-half of one-fifth wider than normal, "W" is two-fifths wider than normal, "X" is normal, "Z" is normal and the character or short and ("&") is at the bottom one-half of one-fifth wider than normal. These proportions do not have to be absolute, as slight deviations do not destroy their uniform ap-

pearance. The round letters, "C," "G," "O," "Q," "S," and "&," should extend a trifle below the base line and the same above the top line. If this rule is ignored, the round letters in a composition will appear smaller than the angular letters. Another very important fact to be remembered is that round letters should be spaced closer to their neighbors than

specific in the description of an alphabet than the word color would be in the description of any specific color.

Here are the names of a number of "Block" alphabets: Tuscan Full Block, Tuscan Block, thick and thin, Tuscan Round Block, Tuscan Round Block, thick and thin, Antique Block, Poster Block, Full

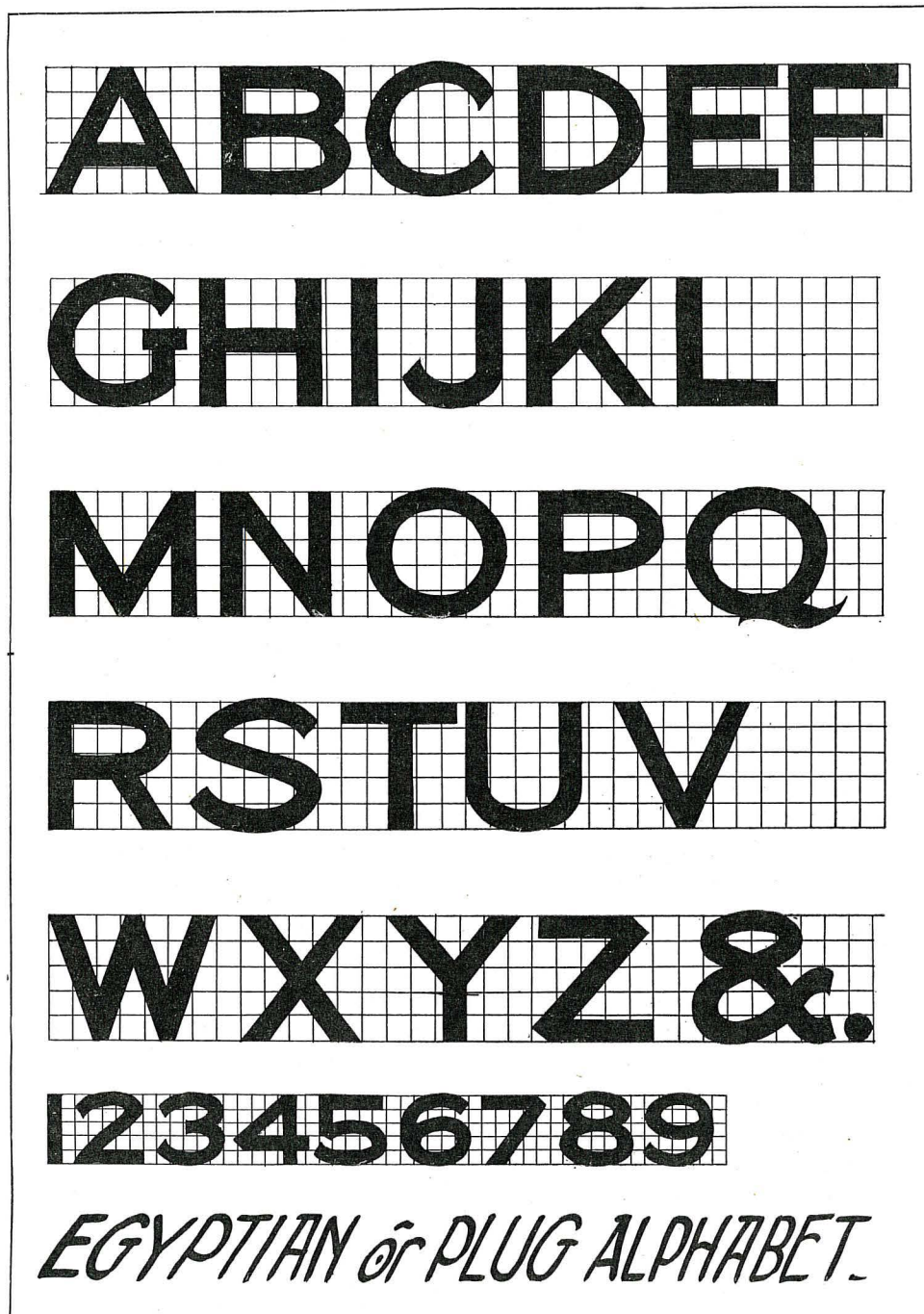


Fig. I

a letter composed of straight lines and the letters "A," "E," "F," "L," "P," "T," "V," "W" and "Y" must be spaced closely owing to their open formation.

The alphabet shown here is the "Egyptian" or "Plug" alphabet and is often referred to as "Block," which is a misnomer. The word "Block" is no more

Block, Full Block, thick and thin, Half Block, Half Block, thick and thin, and these have an endless number of modifications. More could be mentioned but this number is certainly convincing of the unsophisticated misuse of the word block in the description of a letter or alphabet.

Practice in Lettering.

The first practice for freehand lettering should be done on the blackboard with chalk, or on old, unused wall paper which is easily obtained at a wall paper store at nominal cost and is ideal for practice as most of the paper has sufficient "tooth" for use with charcoal sticks.

When the student has become reasonably proficient in the formation of letters with chalk or charcoal, he should practice the letter strokes shown in Fig. III, with a number ten or twelve Red Sable show card brush. It is advisable to use your left hand as a rest for your right hand to work over. Bear in mind that a brush is drawn in the opposite direction from which the hair points and never pushed. In executing this alphabet with a brush, the position of the hands must be changed for each stroke if in different directions, and for round letters the handle of the brush is revolved sufficiently to keep the flat side of the brush at right angles with the line being drawn, so that uniformity in thickness as well as in curve is maintained. After practicing for a reasonable time you will find that you will acquire the "feel" of the brush and it will be possible to form a letter with a brush quite as easily as you do with a pencil. The brush is held as you hold a pencil in writing. The practice strokes are the same to freehand lettering as the scales are to music and if attention is paid to the strokes success is certain.

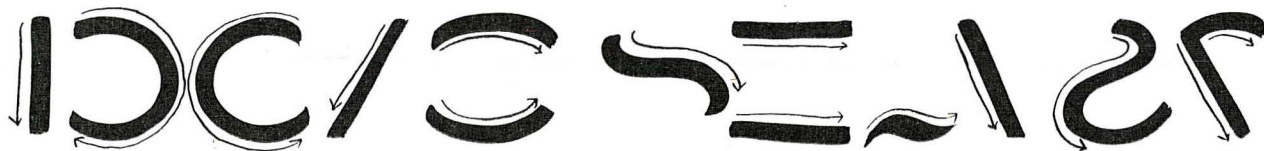


Fig. III.

The proper colors for use with the lettering brush are either the commercial show card colors or simply dry lamp black, ground to a paste under a palette knife on a slab of glass, using alcohol for the grinding liquid.

When a mass about the thickness of vaseline has been attained, add sufficient mucilage to bind.

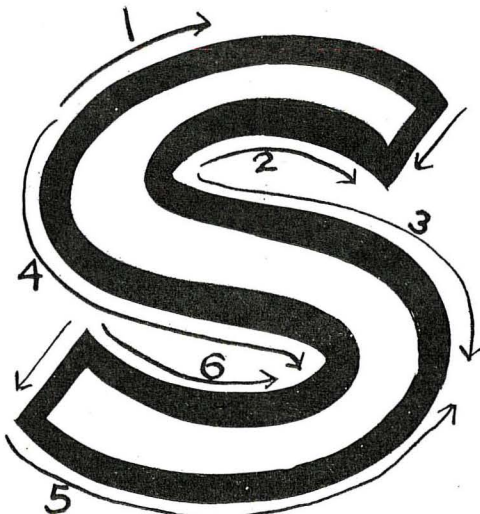


Fig. IV.

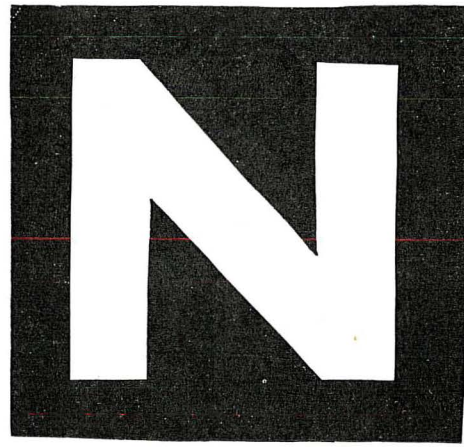


Fig. II.

This can be ascertained by thinning the mixture to the consistency of cream with water, and then apply a little of the mixture to a piece of scrap paper with a brush and hold the paper over a lighted match to hurry drying. When dry, pass your finger over the painted spot. If it rubs off in the form of a dry powder, it needs more mucilage. Care must be taken to get just about enough mucilage added to the mixture, for if an over dose is administered, it will cause the color to peel off. This is quite a consideration where the work is to stand for some time. A few drops of oil of cloves is a sure preventive from deterioration in preparing home-made water colors. This color

should never be exposed to moisture and should be used for interior work only.

For exterior use lamp black ground in Japan is good for temporary work, and for permanent work colors ground in oil should be used.

In Fig. II a letter is shown which has been formed by painting the background and leaving the letter the original color of the background. This process is called, in sign painters' vernacular, "Cutting in" and printers call it a reverse. Fig. IV shows the construction of a letter, the order and direction of each composite stroke. The outline completed, the center is filled in. The proper brushes for this class of work are shown in an accompanying cut.

Brushes used in water colors should be washed in clean water and laid away in a flat box. Brushes used in Japan or oil colors should be washed in turpentine or benzine and then greased with vaseline, lard, lard oil or any non-drying oil. After greasing pull them between the fingers to make the hair flat and lay them away. Never let a brush stand in a vessel as the weight of the handle will bend and all but destroy the brush for further use.

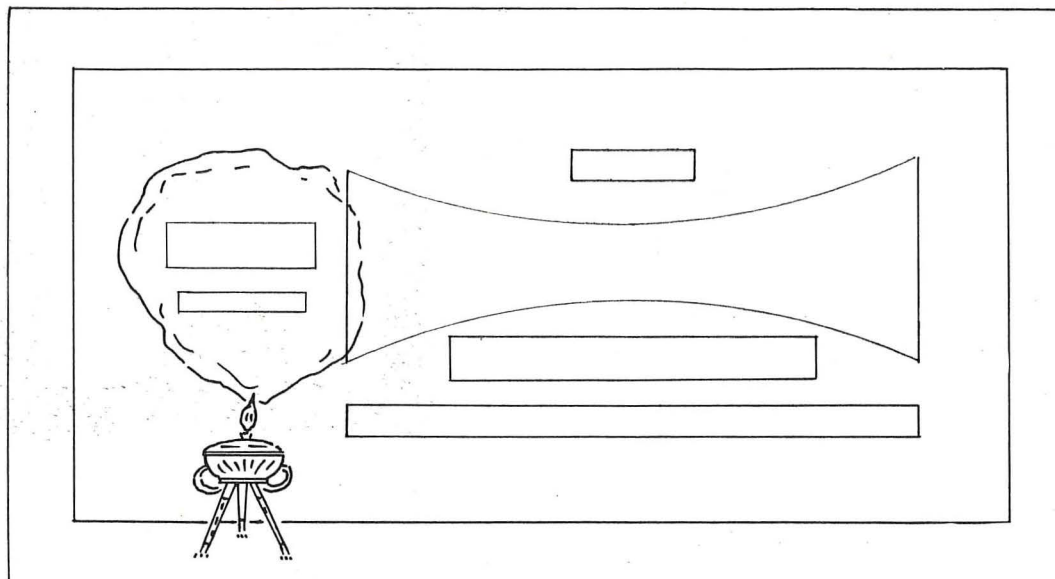


Fig. V.

Composition in all art is a very important factor and applies with especial force to sign painting.

One who can arrange pleasing compositions can be excused for a slight deficiency in lettering, but the opposite of this is intolerable from the view of contemporary artists. Composition is not an accident, but an invaluable component of the lettering art and is the product of intelligent thought.

The best known method for laying out a sign to insure good balance, distinctive design and agreeable composition is shown in Figs. V and VI.

Fig. V shows how to lay out the panels which are to be lettered. This enables one to know just what the finished product will be as to position of different lines of lettering and it establishes the masses. The drawing shown in Fig. V was inked so that the lines would show in reproduction, but in actual sign work a pencil, chalk or charcoal line is easily obliterated, and, in fact, they need not be erased unless the work being done is for close up inspection.

In Fig. VI the panels are shown lettered and a

look with a little thought will readily show the reader the advantage of this method.

Legibility is a most important factor in advertising composition and must be considered first, because without this quality an advertisement would have lost the prime cause for its existence, viz., that of publicity promotion.

Practice the panel method of layout in panels, on scratch paper, and see how many different ways you can lay out the same inscription on the same given space.

The most common mistake made by beginners (and, sad to say, some of the older ones) is to make the design cover too much of the space, leaving hardly any background. Remember this: A five-inch letter on a seven-inch space DOES NOT read as easily as would a three-inch letter on the same space. Avoid clumsy lines in lettering, as a light face type does not obliterate too much background and the result is more satisfactory. The background is just as important as the design itself.



Fig. VI.

PRACTICAL MILLINERY

Madge Lamoreaux, Household Science Department,
University of Illinois



HAT is the most difficult article of clothing to select. The time-honored rule of the milliner is this: "The wearer must look better with her hat on than without it." Yet how few women know how to select a becoming hat! I have often observed that, in a miscellaneous gathering, not one woman out of ten had a hat suited to her own individual style. We are so apt to follow the dictates of fashion and buy the "latest thing," rather than to adapt fashion to our own individuality.

How, you ask, am I to know my individual style? That is a matter of study for each person. Find out which are your best points and which are your poorest. The arrangement of your hair will have a great importance and should be adapted to the shape of the face and to the style of the hat. The same principles of line, rhythm, balance, and unity, apply to hats as to dress. Here are a few suggestions that may help:

1. The best points in the face and coiffure are to be emphasized, and the bad points softened and concealed.

2. The character of the trimming must indicate the purpose for which the hat is intended.

3. A hat should always be suited to the occasion on which it is worn, and to the gown with which it is worn.

4. A hat should be selected and planned in relation to the whole figure, rather than the head alone.

5. The hat should be adapted to the lines of the face and to the coloring of the wearer.

Color and color combinations may present some difficulties to the beginner. Many of the sport hats are made with brilliant coloring, but the street or dress hat should be more subdued in tone. All-white hats are quite the fad both for summer and winter wear. I will mention a few of my ideas about the use of colors which are the most difficult to harmonize.

1. Color should be selected in relation to the skin as well as to the hair.

2. White should be worn by those with clear skin and plenty of color. The many new tones of putty, sand, or any pastel shade are usually becoming to the face when used as a facing to the hat.

Blue-gray is the most trying shade and should be chosen with great care, for it is apt to give the complexion a yellowish tinge. The wearer must have sufficiently clear coloring and personality to form a necessary contrast.

3. Black should not be worn if the skin is dark and swarthy, or too pale, for it will accentuate the lack of coloring. A black facing to a hat is often very

becoming to some persons, as it acts as a frame to the face.

4. Purple and all shades of wistaria can be worn by dark-complexioned persons with clear skin.

5. Brown is especially becoming to people with auburn hair and good complexion.

6. A very blond person looks best in the more delicate shades of any given color. A small amount of black adds character to the hat.

7. The stronger the color, the smaller the amount that should be used in one place.

The contour of the face should be studied. If it be round, you may wear a hat which has:

1. The front slightly tilted upward.
2. The brim tipped to one side to form an oblique line to the face.

3. A rolling brim on the side and front.

4. High, pointed trimming.

If you happen to have a long, thin face, or very small features, you may wear a hat:

1. With trimming to emphasize the width.

2. Tilted slightly over the face.

3. With broad, rolling brim turning down.

4. Narrow, if not too high.

5. With a low, flat crown.

6. A sailor shape.

After you have studied yourself and determined your individual kind of hat, it is only a step to selecting one for someone else. You will be surprised at the ease and certainty with which this may be done after a little practice. Observation will aid you greatly, and a visit to an up-to-date millinery shop which has some pattern hats, or, if that is not possible, an acquaintance with a good millinery magazine will aid in a selection from the latest fashions and in acquiring good ideas.

From the selection of the style the next step is to obtain the hat. Right here is where you may be handicapped, for it is often very difficult to find the hat you are looking for. The best styles may not be available, where you live, and, last but not least, there is often the high price to consider.

Now is the time when, if you can make your own hats and teach others to do likewise, you will have a great advantage. Often a hat made by an amateur is plainly labeled "home-made," but it is not necessarily so, if you learn the simple technique which is the foundation of every well-made hat.

By following accurate directions and by observing some good models, you will soon become skilful. There are few milliners that do not have at least a few pattern hats as models. The best training that I ever received in technique was full-time work in a small but up-to-date shop where I worked side by side with the apprentice, the trimmer, and the

designer. It was the glimpse behind the scenes which made me appreciate the finished product and all the steps thru which it is evolved.

Trimming is the pitfall into which so many amateurs fall, and you will do well to use little or no trimming on your first hats, or else copy accurately some simple trimming which you know to be good style. Fashion will favor you this year, as many of the hats have no trimming, or at most a plain bow, or band of ribbon. Simplicity both in design and trimming is the key-note.

This year there is an infinite variety in the styles. Mme. la Mode is a most lenient ruler, and has set her seal of approval on such a variety of hat styles that every taste and every pocketbook may be suited and pleased.

Among the particular favorites I find the hat with the transparent brim of maline, hair lace, or georgette crepe, with a crown of the same material, or one of velvet or satin. The demand for hand-made hats is increasing, and, instead of the array of milan, leghorn, panama, or felt frames, you see hats made of all kinds and combinations of materials—from gingham and organdie to maline and velvet.

This "hand-made" note is essential in this year's millinery and even on the majority of straw models you find fancy facings and banding. The same hat that is worn in August may be worn in December, and it is very common to see velvet and straw combined on the same model. It seems incongruous to be wearing velvet and velours with the lightest of clothing, but such is the caprice of Dame Fashion.

As for shapes, they may be large, medium, or small. The small hat is usually modelled after the military army cap with or without the visor front. The large, puffy crowns are very popular and youthful, and are becoming to a great many people. Sou-tache braid, chenille, and burnt goose feathers are great favorites for trimming, as well as tassels and balls, altho ribbons will have even a greater popularity than before. Satin, taffeta, and panne velvet are the preferred fabrics. Wool embroidery and crocheted ornaments are very pretty. There is a bewildering array of trimmings from which to choose, but of first importance is the foundation on which to build.

Directions for Making a Willow Frame.

Materials needed:

Sheet of willow 30"x36"
Cotton brace wire
Ribbon brace wire
Tie wire
Pliers
No. 24 milliner's thread
No. 4 milliner's needles
Pins
Lining
Steel wire fasteners

I. Brim:

1. Open cotton brace wire by slipping the roll on arm and allowing it to spring open by twirling wire gently around arm. Always straighten the piece of wire before cutting, by pulling thru fingers.

2. Take head-size with tape, allowing a loose measure. The average head-size is $24\frac{1}{2}$ ".

3. Cut off wire for head-size, allowing 2" for lapping. A pencil or a crayon for black wire may be used for marking, and the measurements must be accurate.

4. Fasten wire at both ends of joining with a 2" piece of tie wire, wrapping twice and twisting ends

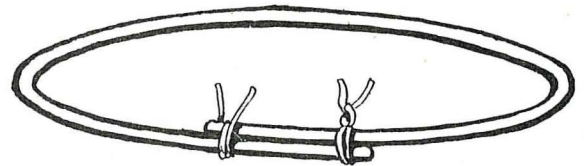


Fig. I. Head-size Wire lapped and tied.

of the wire together with pliers three times. Cut off tie wire $\frac{1}{8}$ " from head-size and press flat with pliers. (Fig. I.)

5. Bend to oblong shape by stretching gently with hands inside of wire, palms facing.

6. To make a paper pattern for flat sailor:

Pin wire to a sheet of stiff paper. Mark line for head-size. Mark front, back and sides of hat. Measure out desired width of brim and draw curve of brim. Back of hat is usually at least $\frac{1}{4}$ " shorter than front. Sides are usually $\frac{1}{4}$ " to $\frac{1}{2}$ " wider than back, but there may be more variation, if desired. Be sure that the curve is true and graceful. Measure 1" inside of head-size and cut out an oval, making slashes $\frac{1}{2}$ " apart and cutting from inside edge to head-size wire. Bend slashed pieces upward at right angles to brim.

7. To make a mushroom shape brim:

Slash brim at right angles to edge in the front, back and sides to within $\frac{1}{2}$ " of head-size. Lap and pin. If a very deep mushroom shape is desired, make slashes at side fronts and side backs also.

8. To make a rolling shape brim:

Cut a slash in pattern for a flat sailor and insert a V of willow where roll is desired. For a slightly rolling brim, dampen and press into shape with palm of hand.

Fit the paper pattern on head until desired shape and size is obtained.

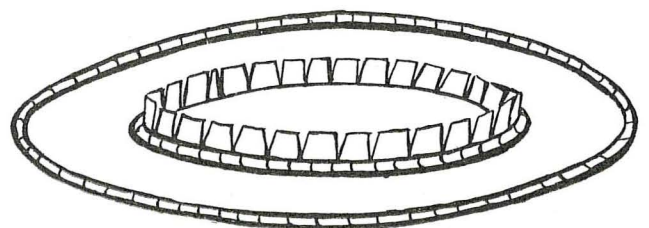


Fig. II. Sailor Shape of Willow with Wiring at Head-size and Edge of Brim.

9. Pin flat pattern on to rough side of willow, placing the front and back on the true bias.

10. Sew on head-size wire, using buttonhole stitches $\frac{1}{2}$ " apart. (Fig. II.)

If slashed, lap and firmly sew the cut edges, using the catch stitch. (Fig. II.)

11. Cut a strip of willow on the true bias $\frac{3}{4}$ " wide and length of head-size plus 1". Pin it outside of slashes and close to head-size wire, sewing with stab stitch. Wire the top of the band, placing wire on outside and lapping 2" in back.

12. Before putting on brim wire, press brim on wrong sides, covering with a damp cloth to steam it into shape. Press until thoroly dry.

13. Cut brim wire the length of outside brim plus 3". Begin sewing at the back, holding wire at edge and the upper side of the brim toward you, and buttonhole from right to left around the edge of the brim. Lap the wire in the middle of the back.

14. Ribbon brace wire may be sewed to front, back and sides for added strength. Allow the brace wire to run from the top edge of the bias head-size band to the outer edge of the brim at right angles to the brim on the upper side.

15. Cut a strip of crinoline on the true bias $1\frac{1}{4}$ " wide. Stretch on to edge of brim, lapping equally on the upper and under sides. Pin into place and sew with stab stitch, taking $\frac{1}{2}$ " stitches. Bind top of bias head-size band in the same manner.

II. Side Crown:

1. Cut a strip of willow on the true bias the desired width (from 2" to 6") and $1\frac{1}{2}$ " longer than head-size. Lap 1" and sew diagonal edges with catch stitch. (Fig. III.)

2. The side-crown is usually at least 1" smaller at the top than at the bottom, but may be more sloping if desired, depending on the height. Cut from 2 to 6 slashes, depending on the slope desired, at equal distances apart to within $\frac{1}{2}$ " of bottom. Overlap and sew with catch stitch. (Fig. III.) Steam and press the side-crown, being careful not to stretch out of shape.

3. Wire upper and lower edges, holding wire on the outside of the crown. (Fig. III.)

4. Bind both edges with strips of crinoline in the same manner as the brim.

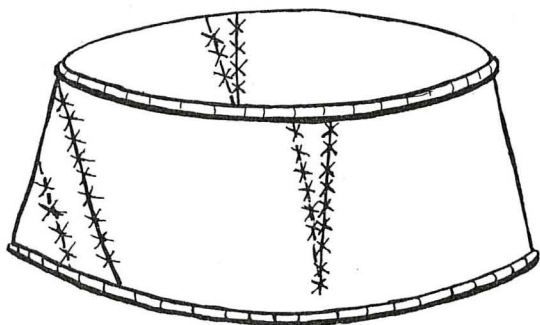


Fig. III. Side View of Side Crown showing Diagonal Closing at Back and Slashes at Sides.

III. Top Crown:

1. A soft top-crown is often used when velvet or satin is to be used as a covering.

2. A stiff top-crown may be made of willow, rice cloth, or crinoline, depending on the amount of stiffness desired. To make a flat crown use the top of the side-crown as a pattern, allowing $\frac{1}{4}$ " for seam. Place pattern with front and back on the bias of the material. Slash edge $\frac{1}{4}$ " apart and bend slashed edges downward at right angles to the top. Insert into top of side-crown and sew in with stab stitch.

3. To make a rounded top, use a form which is the shape desired to stretch it over. Hold in the steam from a tea-kettle, stretching where it is bias and pinning to the form until it is perfectly smooth. Allow it to dry thoroly before removing. This top is fitted into the side-crown and sewed near the top.

IV. Linings for Made Hats:

For satin, taffeta, or medium weight material, use India linen or mousseline.

For georgette crepe, chiffon, or any light weight material, use a cheap thin grade of canton flannel.

For velvet, no lining is necessary.

1. Brim. Lay corner of goods over top of brim, bias of material in front and back. Pin around head-size, smoothing out all wrinkles. If the hat is a sailor shape or very slightly mushroom, the lining may be put on without a seam in the back. Cut out a circle of the material $\frac{3}{4}$ " inside of the head-size and slash in for a short distance. The lining should then be stretched over the head-size band, pinning so that the ends of the slashes fall on the head-size wire. Stretch lining outward over the edge of the brim, pinning in place and working from the front toward the back on both sides. If all the wrinkles can not be smoothed out, a seam must be made at the back, by overlapping edge $\frac{1}{2}$ ".

2. Cut off edge even with the brim. Paste smoothly in place with milliner's glue.

3. Under side of brim may be put on in the same manner, always fitting and pinning first at head-size before stretching.

V. Covering for Made Hats:

The brim and crown are both finished separately before sewing together.

1. Upper brim. Place material over brim with bias at the center front and pin around head-size, working from front to back in the same manner as the

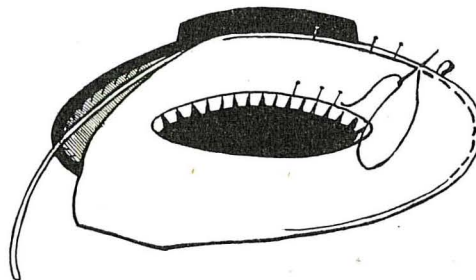


Fig. IV. Facing under Brim to give a Cord Finish.

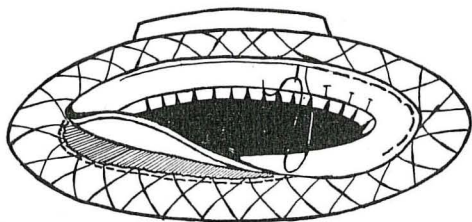


Fig. V. Bias Binding around Edge of Brim and Facing with a Cord Finish extending half way to Edge of Brim.

flannel lining. If it is mushroom shape, it will need to be stretched around the head-size and outward where it is bias. Make a seam in back, if necessary, but all wrinkles must be smoothed out. Sew around head-size with a back stitch. The stitches can be quite long, but they must overlap on the right side. Cut off $\frac{1}{2}$ " beyond the edge of the brim, turning to the underside and sewing to the willow foundation. (Fig. IV.)

2. Side Crown and Top Crown. If a soft crown is to be used, cover the side-crown in the same manner as with the flannel lining. If a stiff crown is used, cut an oval of velvet as large as the top, allowing for a $\frac{1}{2}$ " seam. Stretch over the top, placing bias in front and fasten to side-crown with a stab stitch. Fit the material smoothly over the side-crown, turning under at the bottom, and leaving $\frac{1}{2}$ " at top for finishing. This may be turned in and pinned at the upper edge and slipstitched, or may be finished with a wire. Cut a piece of lace wire the same size as the upper edge. Lay wire against wrong side of the facing and turn the $\frac{1}{2}$ " allowance back of it. Stick pins inside the covered wire and into the frame. These pins will hold the wire to the top of the side-crown. When you reach the back, fasten the ends with a steel wire fastener, pinching it together closely. These fasteners may be purchased by the box wherever millinery supplies are kept. Crease a groove under the wire with the point of a needle and take $\frac{1}{4}$ " stitches which are 1" apart. This wired edge when finished will look like a cord. (Fig. VII.)

3. The underfacing is put on last, unless it is to be of straw, and then it is put on first. For straw, begin at the outer edge and pin one row around

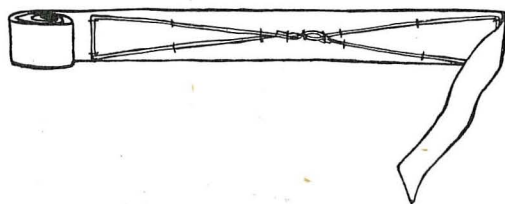


Fig. VI. Wiring of Broad Flat Bow and tacking to Ribbon.

outside, sewing with small stitches, concealed in the straw. Pin on the second row slightly overlapping the first, continuing until head-size is reached. The thread in one edge of the braid may be pulled up slightly to avoid puckering.

4. For a facing of velvet, satin, or georgette crepe, lay material on brim with bias in front, and pin around head-size, cutting the slashes and stretching to the outer edge. Make only one pinhole, if using velvet. (Fig. IV.)

It is a good idea to hold your hat with a small square of velvet, as your thumb is apt to press down the pile and leave a finger mark. Make a seam at the back, if necessary, and cut off around edge, leaving 1" to turn under. Put in the wire same as the top of the side-crown. In putting the needle thru to the top side, slant it so that it is at right angles to the crease

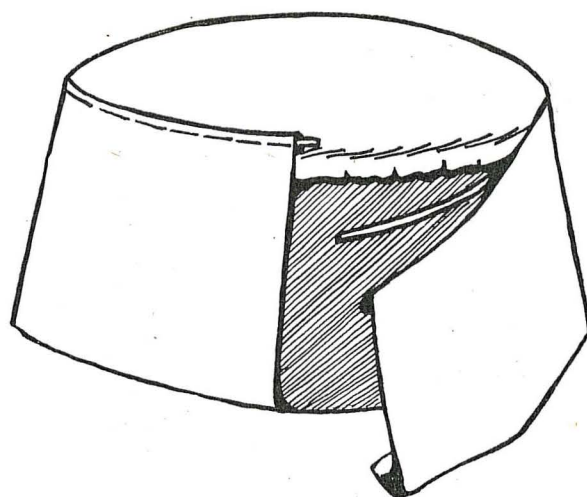


Fig. VII. Covering fastened to Top Crown and Fitted Side Crown with Wire Cording.

line, thus avoiding putting it thru the material on the upper brim. If it seems necessary to bring the needle thru the material, put it back thru the same hole on the upper side. This will not show in velvet.

5. To put on a bias flange (Fig. V). Cut the material on the true bias, making the strip twice the width desired on each side, plus 1" on both edges for seams. Crease in the middle and stretch around the edge of the brim. It is necessary to stretch this as much as possible to avoid wrinkles at the edges of the flange. Pin into place and sew with a back-stitch, allowing the thread to catch the edges on the upper and the under brim at the same time. A facing is put on with a wire on both brims in the same manner as Fig. V, just covering the stitches on the bias flange.

THE PLANER VISE AS A PROJECT

John H. Faust, School of Industrial Arts, Mt. Vernon, N. Y.

AMONG the projects being constructed at the School of Industrial Arts, Mt. Vernon, N. Y., is a planer vise. This tool is of great value to a machine shop, in that it can be used on a milling machine, planer and drill press; on the latter machine it is used almost continually, when holding work for drilling. The base, cap for bearing, and sliding jaw are made of cast-iron, the steel jaws are both hardened and ground, while the gibs and adjusting screw are made of cold rolled steel. As a project it is one of the best for the average school shop, in that it gives

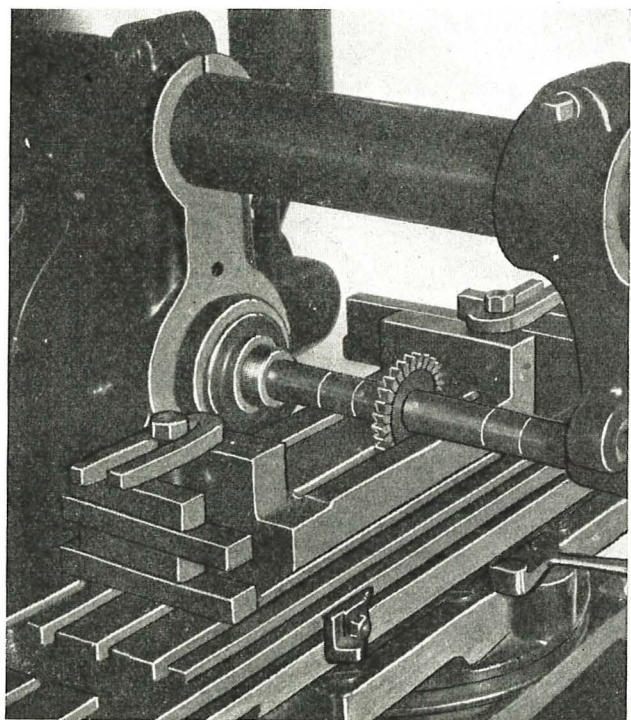


Fig. 1. Cutting Slots for Upper Part of Gib.

the boy an opportunity to use the following machines or tools: Planer or shaper, milling machine, lathe, surface grinder, hardening furnace, files, surface plate and scrapers, as will be outlined.

When making the pattern it gives the boy a very simple operation in patternmaking, as the patterns are not complicated and are easily made. He is to allow for finishing, shrinkage, and draft, so as to prevent the sand from loosening when drawing the pattern from mold, and when the castings finally come in, he is delighted to see his model in a solid mass of iron.

When machining the vise body, the bottom may be planed, shaped or milled with a large surfacing cutter. The sides may be machined likewise, both surfaces being kept parallel to each other and square with bottom. The face of vise and inside part of solid jaw are best shaped or planed and must be kept

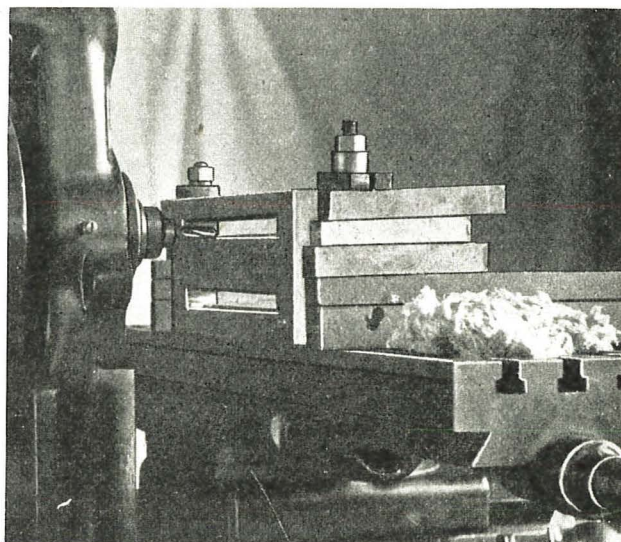


Fig. 2. Finishing End of Slots with End Mill.

both square and parallel to their respective surfaces. The lower half of screw bearing is faced and grooved to receive cap, which is attached after having tongue milled upon it. The gib slots are now carefully marked off and milled with a large cutter to the required size, (Fig. 1) after which the bottom of slot is end-milled to the proper depth to fit gib. (Fig. 2.) The cap and jaw screw holes are next drilled with a jig and finally tapped, after which the vise body is file finished and the important surfaces scraped.

The sliding jaw is shaped on top and bottom to the proper thickness; the four sides are shaped or milled to width and length, keeping them square with each other; the jaw screw holes are drilled with jig and tapped. It is then file finished and scraped.

The stock for the gibs is cut from the bar and milled as shown in Fig. 3; they are then rounded on end, and holes for screws marked off, drilled and counter-bored. The gibs are now filed and fitted to the slots in vise body, after which the sliding jaw is set in position and screw holes spotted with body drill,

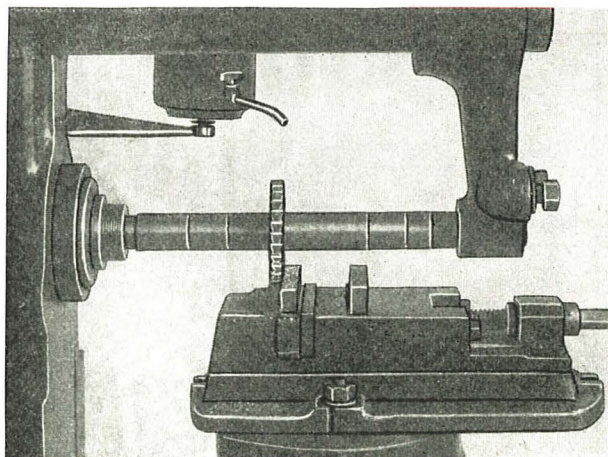
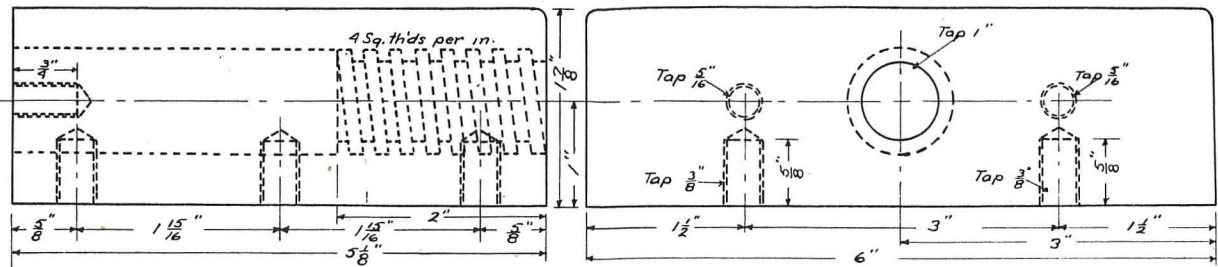
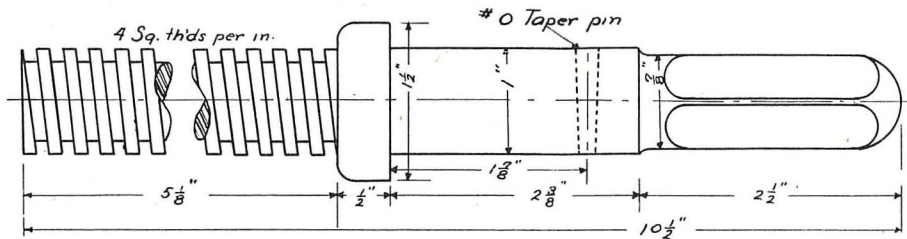


Fig. 3. Milling Gibs.



2 - SLIDING JAW
1 Wanted of C.I. f.a.o.



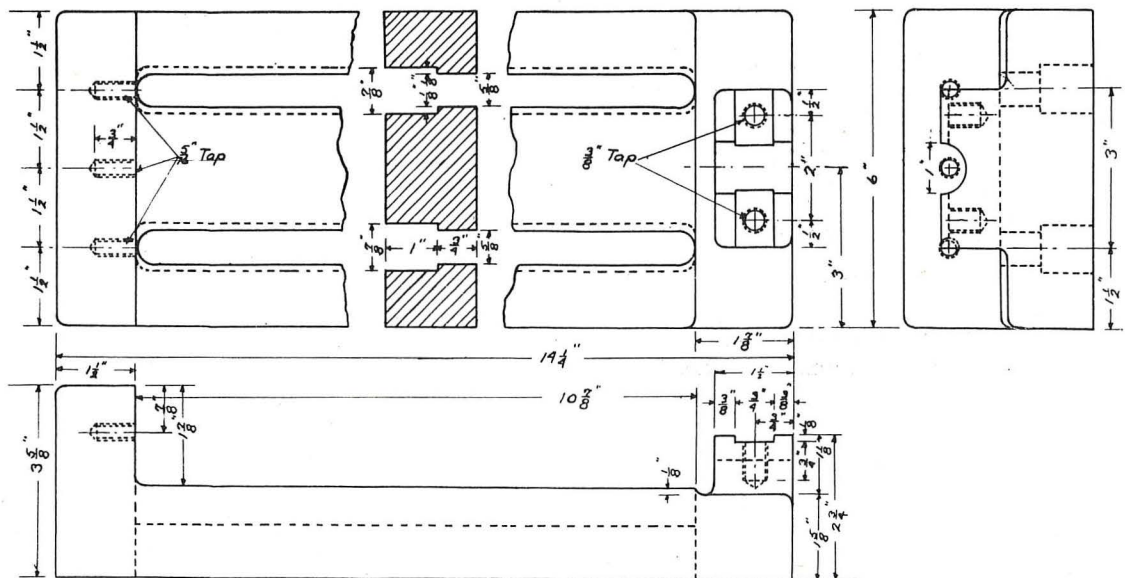
3 - SCREW
1 Wanted Mch. Steel

4" PLAIN VISE

Detail Drawing

Dr. By - E.M. Smith - Date - Nov. 12, 1914

Tr. By - E.M.S. Scale - Full Size
School of Industrial Arts
Mt. Vernon N.Y.



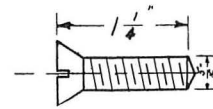
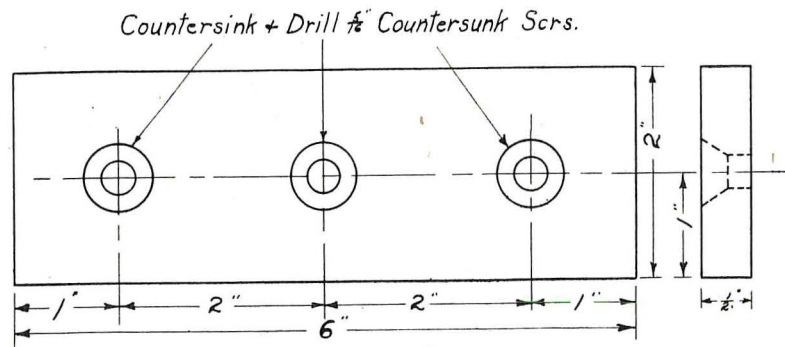
1 - VISE BODY
One Wanted of C.I. f.a.o.

4" PLAIN VISE

Detail Drawing

Dr. By - E.M. Smith Nov. 5, 1914

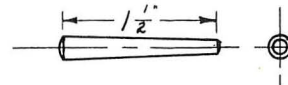
Tr. By - E.M.S. Scale - 1/2 Size
School of Industrial Arts
Mt. Vernon, N.Y.



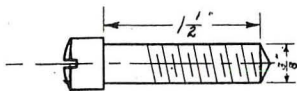
9-SCREW
5 Wanted

5 JAW PLATE.

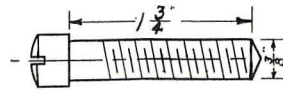
NOTE 2-Wanted T.S. Hardened and Ground.
Omit Center Hole in Sliding Jaw Plate.



10-TAPER PIN.
1 Wanted #0.



8-SCREW
6 Wanted



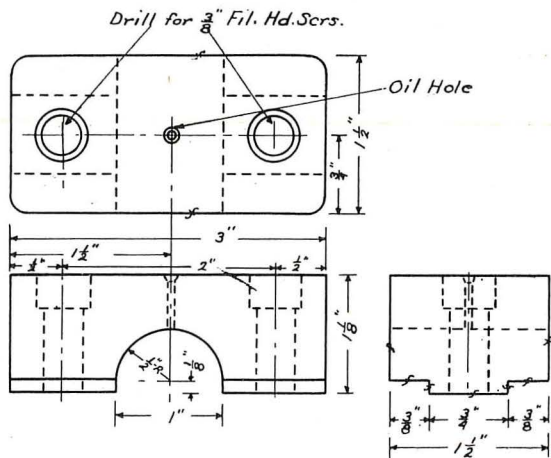
7-SCREW
2 Wanted.

4" PLAIN VISE.
Detail Drawing

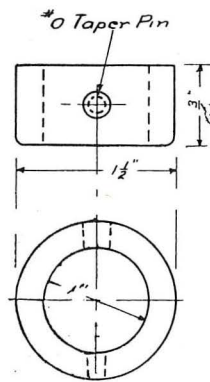
Dr. By- G. DeCortin. Jan. 26 1915.

School of Industrial Arts Tr. By- G. DeC.
Mt. Vernon N. Y.

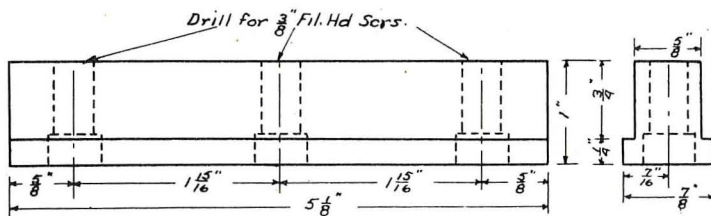
Scale-Full Size.



4-BEARING CAP
1 Wanted C.I.



11-COLLAR
Wanted Mch. Steel f.a.o.



6-GIB
2 Wanted M.S. f.a.o.

4" PLAIN VISE

Detail Drawing

Dr. By- E.M. Smith Nov. 25 1914

Tr. By- E.M.S. Scale-Full Size

School of Industrial Arts
Mt. Vernon N. Y.

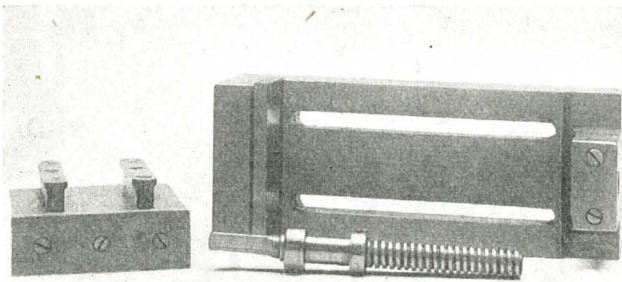


Fig. 4. Vise apart, showing position of Gibs, Jaw Steels and Collar.

drilled with tap drill, tapped and then assembled. (Fig. 4.)

The jaw steels are cut from the bar, shaped to thickness, width and length, $1/32''$ being left for grinding; they are next drilled and counter-sunk for flat head screws, hardened, tempered and ground to proper dimensions, after which they are set on the vise.

For the adjusting screw, the boy cuts off his stock; centers it; puts it between centers and roughs out work, leaving a full $1/64''$ for finishing; he next faces ends and shoulders to proper length and finally finishes to size. (In this piece he gets a variation of sizes and brings in the use of the micrometer extensively.) He is now ready to cut the thread, which gives him the calculation of a square thread, for the depth and width. He then is confronted with the figuring of his change gears; after which he is to get his tools ground to proper sizes, using one to rough out thread and one for finishing, and finally before cutting thread he is shown the necessity of tilting his tool so as to avoid scraping on side of thread. (This angle is figured in a latter part of the course, when the boys are in a more advanced stage of the work.) After thread has been cut, the job is put on the milling machine, using dividing head for cutting square on end for handle; (he then gets the figuring of his index for milling a square). He next gets the cutter set and mills square to proper thickness.

The cap is now attached to vise body and bearing hole marked off, after which it is set up on milling machine, drilled, bored and reamed. It is thru this hole that the tapped hole in sliding jaw is marked off, and in order to do this a bushing is made to fit in bearing, the hole in it being the size of hole to be drilled in jaw. When ready the drill is put in machine, in place of the reamer just used. The jaw is pushed up close to the bearing and kept from sliding back by blocking other end, or wedging pieces between it and the solid jaw. When starting the drill, the bushing acts as a guide and helps to keep the drill centered.

The hole is now drilled thru jaw, after which it is taken apart and about one-half of depth of hole made large enough to let tap slip thru; this is done from face side of jaw. The jaw is again put back and tapped, using bushing to guide tap. Two taps are used for the work, a roughing tap, which has a thinner thread and does not cut the full diameter; the other is a finishing tap which completes the thread.

The collar is made in the following manner: The stock is cut off $\frac{1}{8}''$ wider and about $\frac{1}{8}''$ greater in diameter; it is then chucked, drilled and reamed; after which it is put on mandrel, sides are cut to width, and diameter cut to required dimension. When polished up, it is ready to be assembled with the rest and drilled and reamed in position with a taper reamer, finally pinned with a taper pin.

The vise, during its course of construction, brings out quite a few topics for shop talks:

The necessity of patterns or models for molding.

Cast iron and how made from iron ore; where generally used, and why.

The making of soft steel and its use in commercial shops.

Tool steel; how made and its value in the making of special tools.

Why the milling machine outclasses the planer and shaper in a great many operations.

Reaming; variety of reamers, why used, and size of drill to be used when hole is to be reamed.

Boring; when employed, and why.

Taps; those in general use, calculation of U. S. standard thread. Tap drills and how size is calculated. The distinction between a die cut thread and one cut with a tool on lathe. When each method is generally used.

The square thread; its calculations, general use.

Figuring change gears on lathe.

Figuring index on dividing head.

Hardening; water and oil quenching, case hardening.

Grinding; when, why, and how. Why work is generally ground after hardening.

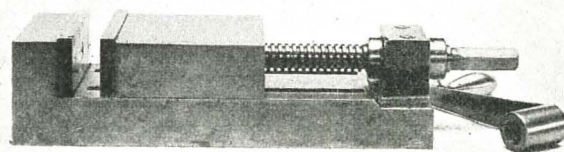


Fig. 5. The Finished Vise.

A STUDY OF GLAZE COMPOSITION

W. G. Whitford

THE FORMULA AND RECIPE.



THE term glaze as used in Ceramics refers to a thin vitreous coating that becomes firmly attached to the body of the ware under heat treatment. This makes the ware impervious to water and gives it a surface that is sanitary and easily cleaned, rendering it hard and serviceable. It gives to pottery its gloss or texture, which is one of its chief charms. There is a certain fascination in glaze work that cannot be equalled in any other craft. The possibilities of extensive glaze experimentation is practically inexhaustible and offers rich fields to the painstaking investigator. New colors, texture, lustres and all kinds of surprises and unexpected results reward the follower of this extremely interesting profession. To the experimenter, the opening of a kiln offers all the eager anticipation of the treasured days of childhood and Christmas morn.

Of course there are disappointments, but these are far overshadowed by the successful results which are sure to come if proper interest, study and care are devoted to the work.

The function of the glaze is two-fold, it makes the ware serviceable and beautiful. In commercial pottery the former is the essential consideration; in school and studio work the latter plays the im-

portant part, but in all cases both considerations are important features and should not be ignored.

With the present knowledge of ceramics it is possible to produce the finest colorings and textures upon the commonest and crudest clays. The potter's handicraft has been raised to the dignity of a fine art with possibilities second to none for aesthetic expression.

Glazes may be classified according to their composition into three groups: I. Salt glazes; II. Raw glazes; and III. Fritted glazes.

The possibilities of salt glazes for art pottery work are great, but as special kilns are required for the work which would place it somewhat out of the field of the public school no discussion of the process will be undertaken at this time. Fritted glazes, which are really the most perfect of all and almost exclusively used in commercial potteries, require a fritt furnace, which the average school does not possess, and consequently will be dismissed with a brief comment.

For commercial pottery certain ingredients, which are soluble, are necessary for efficient use and for certain qualities which cannot be supplied by the insoluble substances used in raw glazes. These soluble ingredients are made insoluble by fritting; i. e., melting into a glass by heat, regrounding and in-

TABLE 1.
Ingredients Used in Raw Uncolored Glazes.

Commercial Name	Chemical Name	Original Formula	Formula after Firing	Equivalent Weight
White lead	Lead carbonate	$\text{Pb}(\text{OH})_2\text{PbCO}_3$	PbO (lead oxide)	258
Whiting	Calcium Carbonate (Carbonate of Lime)	CaCO_3	CaO (Calcium oxide)	100
Feldspar	Orthoclase	$\text{K}_2\text{O}, \text{Al}_2\text{O}_3, 6\text{SiO}_2$	$\text{K}_2\text{O}, \text{Al}_2\text{O}_3, 6\text{SiO}_2$	557
Kaolin	Aluminum silicate	$\text{Al}_2\text{O}_3, 2\text{SiO}_2, 2\text{H}_2\text{O}$	$\text{Al}_2\text{O}_3, 2\text{SiO}_2$	258
Flint	Silica	SiO_2	SiO_2	60
Zinc Oxide	Zinc Oxide	ZnO	ZnO	81
Tin Oxide	Tin Oxide	SnO_2	SnO_2	150
Barium Carbonate	Barium Carbonate	BaCO_3	BaO Barium Oxide	197

TABLE 2.
Metallic Oxides Used as Coloring Ingredients.

Metallic Oxide	Color Produced	Chemical Formula	Formula After Firing	Equivalent Weight
Cobalt Oxide	Blue	CoO	CoO	80
Copper Oxide	Green	CuO	CuO	79
Iron Oxide	Yellow Brown	Fe_2O_3	Fe_2O_3	160
Nickel Oxide	Gray	NiO	NiO	75
Chrome Oxide	Green	Cr_2O_3	Cr_2O_3	152
Manganese Carbonate	Purple (dark)	MnCO_3	MnO_2	115
Yellow Base	Yellow	See note		
Pink Oxide	Red	See note		
Burnt umber	Brown	See note		

Note: Yellow base can be prepared by mixing thoroly 15 parts Litharg (red lead), 10 parts antimony oxide, 4 parts tin oxide and calcining in the regular kiln. The mix should be spread out on a slab or placed in a shallow biscuit dish to permit oxidization. Pink Oxide is a patented color prepared from chromiun and can be obtained from any reliable potter's supply firm. UMBER is an earthy colorant found in Cyprus. It is composed of iron and manganese and when calcined produces a deep chestnut brown stain.

Editors' Note—The author of this series has been, since June first, in camp as a member of the Eleventh Illinois Cavalry and, in consequence, has been unable to answer inquiries concerning the articles.

corporating into the glaze mix. Fritting opens up a far wider field of possibilities, but is unnecessary for school work and should not be undertaken until a good knowledge of raw glazes is obtained. Soluble substances should never be introduced into glazes without fritting for they will be washed away during the process of preparing the glaze.

Raw or earthy glazes are composed entirely of ingredients insoluble in water. They are compounded from the materials as they come from the earth's crust unchanged except for grinding and purifying, hence the term raw or earthy.

The principal ingredients used in compounding raw glazes, and which we will call commercial substances because they are obtained from dealers, are tabulated in Tables 1 and 2.

Glazes are presented in three ways—by the empirical formula, by the batch weight, and by the normative composition. The empirical or chemical formula presents the ingredients according to their chemical per cents and groupings; the batch weight, according to the commercial substances furnishing the chemicals indicated in the formula, and the normative composition according to the mineralogical classification or mineral forming combinations.

A knowledge of all three classifications is necessary for intelligent research work in glazes. Geology and mineralogy must be understood in order to undertake a normative study of glazes, so a discussion of this will not be practical in so brief an article. Glaze work can be done without knowledge of the empirical formula, working simply from the batch weight; but it is really working in the dark and acknowledges

PbO	CaO	K ₂ O	Al ₂ O ₃	SiO ₂	Commercial Substances	Per cents	Equivalent Weights	Batch Weights
.70	.20	.10	.20	1.60				

lack of basic principle to begin with. The empirical formula throws light on the entire glaze proposition. It supplies a means of comparison of one glaze with another upon somewhat of a scientific basis, showing the effect of variation of any substance constituting the glaze, or the effect of removing or adding various substances. In other words, its use makes possible the studying and checking up of information and data concerning glazes that is accurate and can be duplicated with certainty. It also opens a wide field of experimentation with the fascinating possibility of discovery and surprises.

Glazes are usually presented by means of the chemical or empirical formula. As this form is often given without the batch weight, it is necessary to know how to figure the batch weight from the formula.

Assuming that chemistry is understood slightly by the average teacher and high school student, the problem of figuring the batch weight from the formula will be given as the first step in glaze work. The first few chapters of any good high school chemistry will explain enough of this subject to enable anyone to do the work.

The chemical formula is an assemblage of elements represented by their symbols and in the glaze formula are so arranged as to give a ready means of comparison. It should be noted especially that the glaze formula is so grouped that the different oxides fall into three classes. All the chemicals of one oxygen atom content are placed in the first column, called the mon-oxide column; the chemicals having three oxygen atoms in the middle column called the tri-oxide column; and those having two oxygen atoms in the third column called the di-oxide column. The per cent of oxides used in the mon-oxide column must always be brought to unity, i. e., total 100%.

The empirical formula represents only the oxides, and the per cent of each, which constitute the glaze. As the chemicals given in the formula cannot be weighed in this form it becomes necessary to translate the formula into the commercial or natural substances that furnish the chemicals indicated in the formula. In order to do this we must know what ingredients have the proper chemical composition to supply these oxides. See Table I.

Problem: Formula of glaze given. Translate the formula into its batch weight.

Monoxide	Trioxide	Dioxide
PbO .70	Al ₂ O ₃ .20	{ SiO ₂ 1.60
CaO .20		
K ₂ O .10		
1.00		

The first step in the procedure is to arrange the chemicals listed in the formula with their per cents in a horizontal line.

leaving space at the side for the list of ingredients that are necessary to supply the chemicals.

This is simply a mathematical readjustment as in case of division by the arrangement of the divisor, dividend and quotient, which cannot be explained except for ease of procedure.

The first item listed is PbO, lead oxide. By looking at the table of commercial substances we find that white lead will supply the PbO and will give us none of the other substances listed, so we will need .70 white lead to supply the PbO required. Likewise whiting (.20) will supply all the CaO, calcium oxide. For potash, K₂O, we find that feldspar will supply this, but it also supplies with it alumina, (Al₂O₃), and silica, (SiO₂), feldspar having these chemicals in the proportion of 1K₂O, 1Al₂O₃, 6 SiO₂. Therefore .10 feldspar will supply all the K₂O, .10 Al₂O₃ and .60 SiO₂, all of which is needed for the glaze. Feldspar is a natural substance very valuable from the potter's standpoint. Al₂O₃ (aluminum) can be supplied from kaolin, (North Carolina kaolin), but kaolin has a composition of 1 Al₂O₃, 2 SiO₂, so .10 kaolin will supply all the

PbO	CaO	K ₂ O	Al ₂ O ₃	SiO ₂	Commercial Substances	Per cents	Equivalent Weights	Batch Weights
.70	.20	.10	.20	1.60				
.70					White lead	.70	X 258	= 180.60
.00	.20				Whiting	.20	X 100	= 20.00
	.00	.10	.10	.60	Feldspar	.10	X 557	= 55.70
		.00	.10	1.00	North Carolina Kaolin	.10	X 258	= 25.80
			.10	.20				
			.00	.80	Flint	.80	X 60	= 48.00
				.00				330.10

Al₂O₃ needed and .20 SiO₂. The remaining SiO₂ can be supplied from quartz or flint (.80), which is pure silica. By listing the ingredients at one side, which supply the chemicals needed and carrying out the proper amounts each material furnishes under its respective column, subtracting and proceeding until all the chemicals are supplied, we soon have the formula translated into terms

These basic glazes should be prepared according to directions, and after trials for the kiln have been made, put away for future use. For small batches the materials are usually weighed in grams. For larger quantities ounces or pounds can be used. Any unit of weight can be multiplied five or ten-fold to suit conditions.

For the proper working of mat glazes careful

CoO	PbO	CaO	K ₂ O	Al ₂ O ₃	SiO ₂	Commercial Substances	Per cents	Equivalent Weights	Batch Weights
.03	.52	.25	.20	.35	1.50				
.03						Cobalt Oxide	.03	X 80	= 2.40
.00	.52					White lead	.52	X 258	= 134.20
	.00	.25				Whiting	.25	X 100	= 25.00
		.00	.20	.20	1.20	Feldspar	.20	X 557	= 111.40
			.00	.15	.30				
				.15	.30	North Carolina Kaolin	.15	X 258	= 38.70
				.00	.00				311.70

representing commercial substances required to compound it. It is now necessary to multiply the per cent of each ingredient by its chemical equivalent weight to bring them all to chemically equivalent quantities. This result then becomes units of weight or measure; it can be grains, ounces, pounds, quarts, bushels, tons, etc., so long as the same measure is used in all cases. The result represents the batch weight or recipe and from it the materials can be weighed and prepared for use.

The complete method of procedure for this glaze, No. 18, of the charts, is given below. (This is a good bright glaze at temperatures from cone 05 to 3.)

The method of procedure for mat glazes is the same, only in this case no flint is required.

Empirical Formula. Blue Mat. (B) of Table 3.

CoO .03	Al ₂ O ₃ .35	SiO ₂ 1.50
PbO .52		
CaO .25		
K ₂ O .20		

The following table gives a list of basic mat glazes that constitute a palette of ceramic hues from which all other colors, shades, and tints in our exercises will be prepared. Glaze A is white and semi-opaque, the others are colored by means of the mineral oxides indicated in the formula, except in G, H and I where the color is introduced from a prepared stain and added by per cent to the batch weight. This palette can be enlarged and varied as experience in glaze work develops.

The mat glazes tabulated below, if properly prepared, will be of fine texture and pleasing quality.

grinding and mixing is required. This is done with a ball mill. The glaze batch is weighed up, put into the ball mill jars, and allowed to grind from one to two hours. The mills are half filled with one-inch flint pebbles or porcelain balls, which revolve with the mill inside the jars and grind the ingredients of the glaze.

About one pint of water is added to every pound of glaze.

After the glaze is well ground it is taken from the mill, run thru a 100, or, better, 120, mesh sieve, to remove coarse particles and placed in a bowl to settle over night. Later the water is siphoned off, leaving the glaze in a thick, creamy condition in the bottom of the bowl. This can be used at once or put into plaster bats and dried out for future use, but before applying the glaze to the ware it should be mixed with gum tragacanth, gum arabic or dextrine, which acts as mucilage and keeps the glaze from cracking off the ware when dry, and thus allows handling. About one tablespoonful of gum is used for each quart of glaze.

This gum comes in dry flakes much like glue. This is mixed by adding one ounce (28.35 grams) of gum to two quarts of warm water. After standing for 24 hours (or, better, steeping for several hours) the gum is worked up well with an egg beater until free from lumps. Keep gum quite thick. A few drops of carbolic acid or some other convenient germicide added will prevent offensive odors from developing. (To keep gum at proper thickness pour

off the water from the top and then add more from time to time as it evaporates.)

Before the glaze is applied to the biscuit ware (this name applies to all pottery once fired without a glaze) the ware must be soaked in clean water, then taken out and wiped dry. The glaze can then be evenly applied by dipping or pouring.

Biscuit ware has merely received one fire, and that in order to transform it from the clay state to a fused pottery body. It is still porous and the glaze is applied with two purposes; utility, to make the ware hold water, and to give it a finish; and decorative quality, i. e., beauty.

Charts 5, 6, 7 and 8 illustrate one of many interesting series of experiments with the essential raw materials used in glaze work. This is the Ternary system of glaze investigation and is conducted on the

from 1 formula weight of North Carolina kaolin and 1 formula weight of whiting) was incorporated into each of the three glazes.

Formula No. 1			Batch Weight	
.9 K ₂ O {	Al ₂ O ₃	} SiO ₂	Feldspar.....	501.3
.1 CaO {	1.0	} 5.6	Whiting.....	10.0
			North Carolina Kaolin.....	25.8
				537.1

Formula No. 10.			Batch Weight.	
.9 PbO {	Al ₂ O ₃	} SiO ₂	White lead.....	232.2
.1 CaO {	.10	} 1.1	Whiting.....	10.0
			North Carolina Kaolin.....	25.8
			Flint.....	54.0
				322.0

TABLE 3—BASIC MAT GLAZES.

Composition of Glazes.

Empirical Formulas.

Color	Coloring Oxide	PbO	CaO	K ₂ O	Al ₂ O ₃	SiO ₂
(A) White		.55	.25	.20	.35	1.5
(B) Blue	CoO	.03	.52	.25	.20	.35
(C) Green	CuO	.10	.45	.25	.20	.35
(D) Yellow	Fe ₂ O ₃	.10	.55	.25	.20	.35
Brown						
(E) Gray	NiO	.05	.55	.20	.20	.35
(F) Purple	MnO	.05	.50	.25	.20	.35
(dark)						
(G) Yellow	Yellow Base (10%)	.55	.25	.20	.35	1.5
(H) Red	Pink Oxide (10%)	.55	.25	.20	.35	1.5
(I) Brown	Burnt Umber (7%)	.55	.25	.20	.35	1.5

Batch Weights.

Color	Coloring Oxide	White Lead	Whiting	Feldspar	North Carolina Kaolin	Total
(A) White		141.9	25.0	111.4	38.7	317.0
(B) Blue	Cobalt Oxide	2.4	134.2	25.0	111.4	311.7
(C) Green	Copper Oxide	7.9	116.1	25.0	111.4	299.1
(D) Yellow	Iron Oxide	16.0	141.9	25.0	111.4	333.0
Brown						
(E) Gray	Nickel Oxide	3.7	141.9	20.0	111.4	315.7
(F) Purple	Manganese					
(dark)	Carbonate	5.7	129.0	25.0	111.4	309.8
(G) Yellow	Yellow Base	31.7	141.9	25.0	111.4	348.7
(H) Red	Pink Oxide	31.7	141.9	25.0	111.4	348.7
(I) Brown	Burnt Umber	22.2	141.9	25.0	111.4	339.2

triaxle bases, giving possibilities of 55 blends or distinct glazes compounded from three basic formulae.

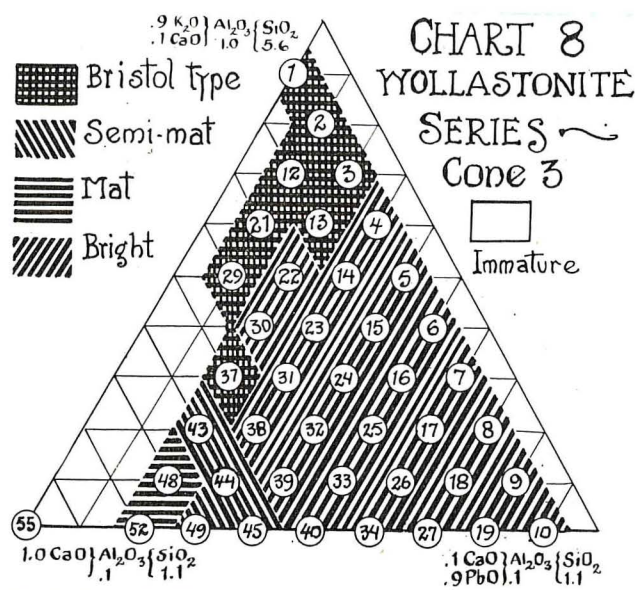
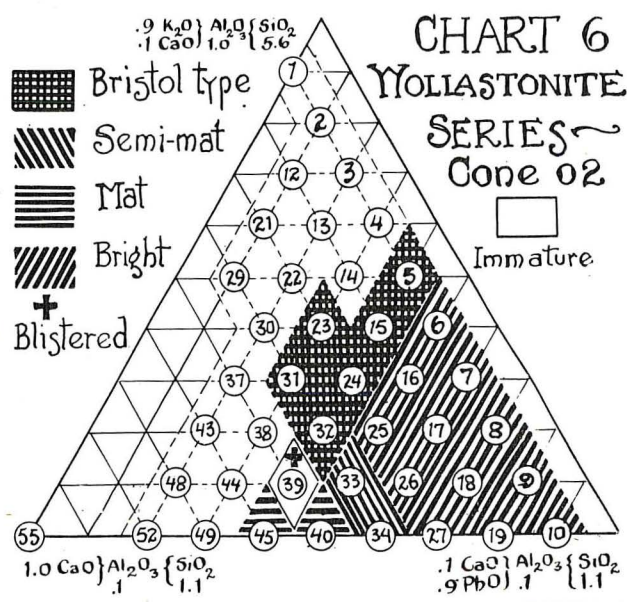
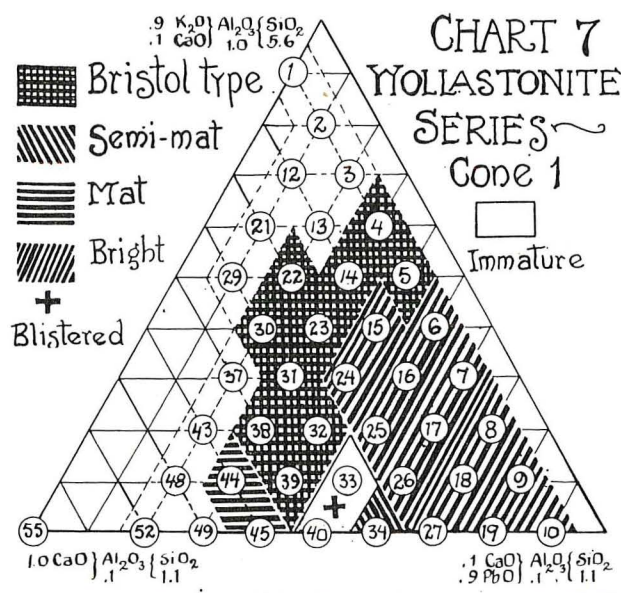
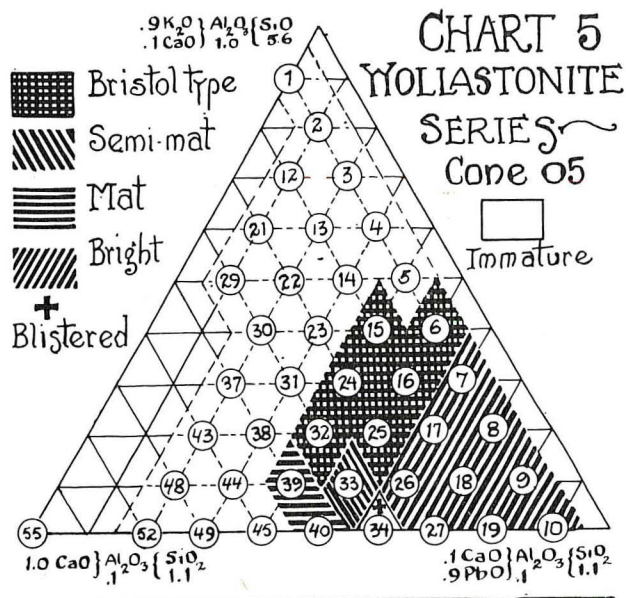
A study of the charts will show the possibilities of such a method. The three basic glazes No. 1, No. 10 and No. 55 (formulae given below) introduce three important ingredients or norms of the glaze compound, feldspar, lime and lead. Glaze No. 1 introduces Orthoclase, potash feldspar; No. 55 the lime or Wollastonite, made from 1 formula weight of whiting and 1 formula weight of flint, and No. 10 the lead or lead meta silicate, made from 1 equivalent ($\frac{1}{3}$ formula weight) white lead and 1 formula weight of flint.

Owing to the difficulty of floating glazes containing no clay 1/10 formula weight of anothite (made

Formula No. 55.			Batch Weight.	
1.0 CaO {	Al ₂ O ₃	} SiO ₂	Whiting.....	100.0
	.10	} 1.1	North Carolina Kaolin.....	25.8
			Flint.....	54.0
				179.8

These basic glazes were ground thoroly in the ball mill and blended upon the base of ninths. Glaze No. 4 would have a composition of 3/9 of No. 1 and 6/9 of No. 10; Glaze No. 15, 4/9 of No. 1, 4/9 of No. 10, and 1/9 of No. 55; Glaze No. 45, 4/9 of No. 55 and 5/9 of No. 10; Glaze No. 18, 1/9 of No. 1, 7/9 of No. 10, 1/9 of No. 55, etc.

The blending can be done with the glazes either dry or wet. In the first case the basic glazes must



be dried and the proportionate amounts weighed dry. The resulting mixtures must then be thoroly ground upon a glass slab with a spatula, adding enough water to bring the mass to a thin creamy condition. If sufficient care is taken in the mixing this is the better method for limited laboratory equipment. If the glaze work is to be conducted extensively the wet method is better. In this case the basic glazes would be prepared as usual, a moisture factor would be taken and the different blends, weighed in liquid condition, put into small jars (one-quart fruit

jars) and labeled.

In either case the blends are prepared for the kiln by applying to small tile. White wall-tile biscuit ($1\frac{1}{2} \times 3$ ") can be obtained from any tile works, or these can be made from any light-burning clay.

The series shown in the charts were fired at four different temperatures, cone 05, 1050°C. ; cone 02, 1110°C. ; cone 1, 1150°C. ; and cone 3, 1190°C. to study the effect of heat treatment. Four types of glazes were developed varying in area with the heat treatment, as can be noted on the charts.

The third article of the series on Period Furniture by Messrs. Weiffenbach and Anderson, will appear in the November Magazine.—Editors.

The Reminiscences of a Drawing Teacher

Maud M. Miles, Kansas City

(Concluded from September)

The design class are already carving wood blocks, having grown tired of dull and theoretical design. The practical application of some of their work has already enlivened the interest and the work speeds on, in rapid bounds. The life class is the class which is having the happiest time this week, because they are going on with the work that is the natural outgrowth of the work of the two preceding weeks. Two girls have posed for the class, Margaret and Anna. The girls are utterly unlike—yet I defy a Scotland Yard detective to tell which girl the drawings are intended to represent.

Don't think that I am the least bit discouraged about this. While I don't want to boast too much, I am sure that some of the drawings already are beginning to look human. A few of the students, who have taken "life" before, really make good sketches.

Two more weeks have flown away, and every class has grown considerably. The freshmen have drawn a coffee-mill over and over again. I cannot say that any of the drawings of the coffee-mill are near perfection. Some are too high for their width, and some are too wide for their height. Some of the level and straight lines fail to vanish as they should and circles seem to refuse to be the right width, but every child, without exception, has grown remarkably in his ability to perceive the real appearance of the plain, old-fashioned coffee-mill.

We have sketched for the last three Fridays, and some of the freshmen are beginning to do pretty well. Hard, wiry lines seem to be natural to most of them. I say but little to them about the quality of their lines, because I do not wish to discourage them by telling them too many things at once.

If the student thinks too much of details, he will lose his conscious thought of structure. I feel, at this stage, that the principal stress should be laid on structure. Little by little I will speak more to them in regard to the manner of drawing.

The "life" class, only seventeen of them in all, has developed a desire to make pictures of their sketches. When any student draws a figure as well as he can, and gets thru before the class is ready to change to another pose, I permit him to put in a background of his own imagining, to add interest to his sketch.

One of the girls in the class has a fairy costume that she wore to a party several years ago. Rebecca, the baby of the class, just fits the costume and so several of the pupils have begun a series of fairy pictures, with little Rebecca as the model. Several of the boys, who have special talent in sketching, have brought in sketches made outside of the school, in the assembly hall, and other places. I do not al-

ways feel that these are the most hopeful students, by any means. Sometimes the child who seemed to have the most talent at the beginning of the year, fails to develop as he should.

The most frequent cause of this failure is, I am sorry to say, his conceit. His classmates admire and extol his early efforts and his teachers herald him as a genius of rare ability. When once he is induced to believe all these things that are said about him, the efforts of his drawing teacher are very nearly futile. He knows more than she does, in his own mind, and refuses to "spoil" those "marvelous" drawings of his, that win him so much praise.

Sometimes the boys like to go to other departments to sketch. It makes them feel important and keeps up their interest to be allowed to do this. If they will only feel just important enough and not too much so, they grow, just as a plant grows that is neither too warm nor too cold. That is one of the chief problems of the drawing teacher. Such a teacher should strive to keep up the student's interest and encourage a helpful confidence in his own ability, without developing this unfortunate conceit.

Three of the sketches that were made by the boys in other departments are worthy of mention. One represents the "Pompeian Flower Girl" in a dance recently given by the girls' gymnasium classes before the school.

While the drawing lacks much that could be desired, it has much of the action and spirit of the dance, as it was given. The drawing was made by a sixteen-year-old boy, without any criticism or assistance from his teacher, and was made from note-book sketches taken while the dance was in progress in the assembly hall. Illustration 1.

Another boy visited the joinery class and induced a friend of his to pose for him there. As the model posed for the drawing, it lacks the action and freedom that is displayed in the drawing of the girl.

I like the simple way in which he has expressed the drawing of the young carpenter, but if he hadn't inked it in before consulting me, I should have sug-



Illustration 1.

gested a few changes in it. This boy possesses a peculiar talent for perspective, and everything that he makes shows this talent whether he gets the rest of his drawing well or not.

The third boy of whom I was speaking does not possess this talent for perspective. It is with difficulty that he holds himself to the consideration of it or to anything so mechanical. He is a student who sees too much and remembers too well all that his teacher says to him. In thinking of my various instructions regarding the planes and the structure



Illus. 2.

of the head and figure, he loses sight of some of the other things. I believe he is a student who will go beyond the other two in art work, because of these things that I have mentioned; but at present his drawings are not always so pleasing as those of the other two boys. These peculiarities of his are evidenced in the drawing

he just handed in, which he made of the assistant in the chemistry department.

One cannot always tell who is the best student, and the most promising, by judging the actual drawings that he hands in. Sometimes the least agreeable drawings are the ones that show the most promise to an experienced teacher.

As I have said before, we have been sketching in all of the classes the last three Fridays. I am not able to look at all of the drawings while the model is posing, because the classes are large and because I do not begin to criticise until each pupil has his drawing well under way. When the work is ended, it is handed in, graded, corrected and handed back to the student. Janet handed in one of the most agreeable looking drawings on the first Friday. It represented the side view facing to the left. She received a good grade on this drawing. The second Friday she handed in another drawing surprisingly like that of the preceding week, exactly side view and facing to the left. I decided to investigate and see why it was that Janet succeeded in always getting exactly the same view of the model. So, yesterday, I took particular pains to look at Janet's drawing while the model was posing. I found the little lady seated where she got a three-quarter view of the model, facing toward the right. Upon the paper she had a nearly completed drawing of an exact side view facing the left. Janet had learned a little "stunt." At some time someone had shown her just how to draw a side view of a model facing to the left. It takes almost as powerful a force as dynamite to eradicate such a notion out of the mind of the pupil.

They will declare that they can't draw any other view and it sometimes takes months of work to make them willing to make less attractive drawing, in an honest effort to see truly. The teacher has to insist and demand that they draw the view they actually see.

When the first attempt is made to do this the result on paper is painful. The student resents the lower grade that must be given him. It takes a good deal of courage on his part to hand in a drawing that receives a low grade, but which is honest and which will help him to grow, rather than to everlastingly perform some little "stunt" that he has found easy to do.

I find that the students in sketching begin early to want to use their sketches for illustrating purposes. While I do not teach "commercial art," I encourage this tendency and allow them to adapt their sketches to illustrating purposes, whenever they wish. The result of this has been that two of my boys who graduated last year (each only sixteen years of age) went directly from the high school into commercial work. One is in the drawing department of an engraving firm, and the other, in an architect's office where he draws, free-hand, the details of architectural ornament.

One cannot restrict this privilege of making pictures of their drawings to the talented pupils. Katherine had written a poem, much resembling a Mother Goose jingle, because she saw a teacher (who had not learned how to use the new drinking fountains in the hall) give herself an unexpected bath. When Katherine had written this verse she wished to illustrate it. I presume she thought it safer to show it to her drawing teacher rather than to her English. I do not know what her English teacher would say concerning her poetical ability but I did not feel myself called upon to discuss that. I permitted her to letter the verse as best she could and draw an illustration. One of the girls was called upon to pose for the drawing and the sketch Katherine made in pencil from the actual pose was pretty good. Then, I suggested that she draw it in ink, because book illustrations are usually drawn in that medium. It was Katherine's first attempt and she made her lines hard and wiry, and her figure and her perspective grew worse and worse as the drawing progressed. This tendency to make hard and wiry lines is one of the first things that I try to discourage in the minds of the pupils.

When I begin to talk of technique, I do not insist that every pupil in the class use the same technique. Some of them have been taught, in the grade school, certain things in regard to the use of the pencil and pen, and sometimes their ideas are fairly good. I feel that it is a waste of energy on the part of the teacher, and an unnecessary discouragement for the pupils, for the teacher to try to make each student forget what he has learned, and do her way. So far as I am concerned I feel that

I have not progressed very high in art when I am teaching drawing in a public school. I hope and pray that some of my pupils will go beyond anything that I have ever done. Indeed, many of them now do things that I could not do so well myself. Everyone does some things better than others and I have never had a pupil who could do as many things as well as I could do, but some of my boys can draw better cartoons today than I can now, altho I was a far better cartoonist at their age. So, I do not try to make all of my pupils draw like each other, nor try to make them draw as I do.

If there is anything about their technique I do not like, I criticise it. If there is anything I do like, I point it out. The hard, wiry line, as I said before, is one of the most common faults they have. Consider this drawing of the girl in the gateway made by one of the girls in my class. The background and all but the girl was put in from imagination, because the girl wished to make a picture out of her drawing. The sketch in pencil was far superior to the ink drawing that she made of it. When she began to use the unaccustomed medium of pen and ink, she set her knuckles, grasped her pen with all her might and made hard, wooden lines.

Now, what is the teacher to do in a case like that? How much good does it do to sit down and say, "May dear, your mind is already filled with forebodings as to the possible mistakes you may make in the use of pen and ink. Allow me to add a few other "dont's" to the already full supply of them, and also, to tell you a few dozen things that you *must* do at the same time." For instance, I might say, "All of the lines should be drawn vertically," or "Every line should follow the direction of the

plane on which it is supposed to rest," or any of the other pet foibles of the drawing teacher. Is it any wonder that students, so annoyed, often "go to pieces" and cease to study the subject? How shall I show this girl how to treat the lines when she develops another sketch into pen and ink drawing? "The International Studio" is my textbook in such cases. Five or six copies of that are brought in and we look the pages over together, and here and there we find a pen and ink drawing, or an etching. We see that no two artists use their lines in the same way, but that each one uses the lines that he does for some definite and exact reason.

Often I do not express any preference in regard to the styles. I allow the student to pick out any one that he likes and copy it. It is actually a rare thing when I find any two students copying the same drawing. If, perchance, there is a drawing that I dislike for any reason, I warn the pupil against copying it.

I have him make his drawing twice as long and twice as wide as the drawing in the book, and have him actually count the lines, if such a thing be possible. He must put in only as many lines as he actually finds in his drawing, making each and every one of the lines twice as long and twice as wide as he finds it. I do not give him "credit" for making these drawings. These are not a part of his school work; they are simply "extras." In this way I prevent his falling into the habit and of becoming a chronic copyist. I think a certain amount of intelligent copying of good drawings is good medicine for the pupil, but should not be used as a steady diet, any more than quinine and cod liver oil should take the place of his daily food.

MAKING SCHOOL EQUIPMENT

J. Louis Crisp, Director of Manual Arts Department,
Junior High School, Trenton, N. J.



THE individualistic problem scheme in manual training courses seems to be so much at variance with all modern business and thought, that it compels one to wonder why any school system ever tolerates it.

The day of the individual has passed.

Then, why have boys, at the most impressionable age, working on all kinds of problems that distinctly please or benefit them as individuals?

Most of us are convinced that a boy should be taught early, that "no man liveth to himself." He is a part of a plan.

Teach him his obligation to his school.

Have him realize that he can not receive all and give none and have a permanent satisfaction in his work.

The boys in the new Junior High School of

Trenton are surrounded by equipment made for their use by the classes of last year.

The boys working in the print shop stand before fifteen double case stands made for their use by the boys of the ninth and tenth grades.

The boys in the elementary wood shop are using 30 cabinet benches, and the boys in the drawing rooms are using 60 cabinet drawing desks, all of which were made by the preceding classes.

All of this work was done last year at a great saving to the Board of Education. No jigs were used, thus retaining the maximum educational value. This equipment is a constant inspiration to all boys in the manual arts course to render service to their school.

The drawing accompanying this article is a drawing of the bench constructed for use in the elementary wood shop.

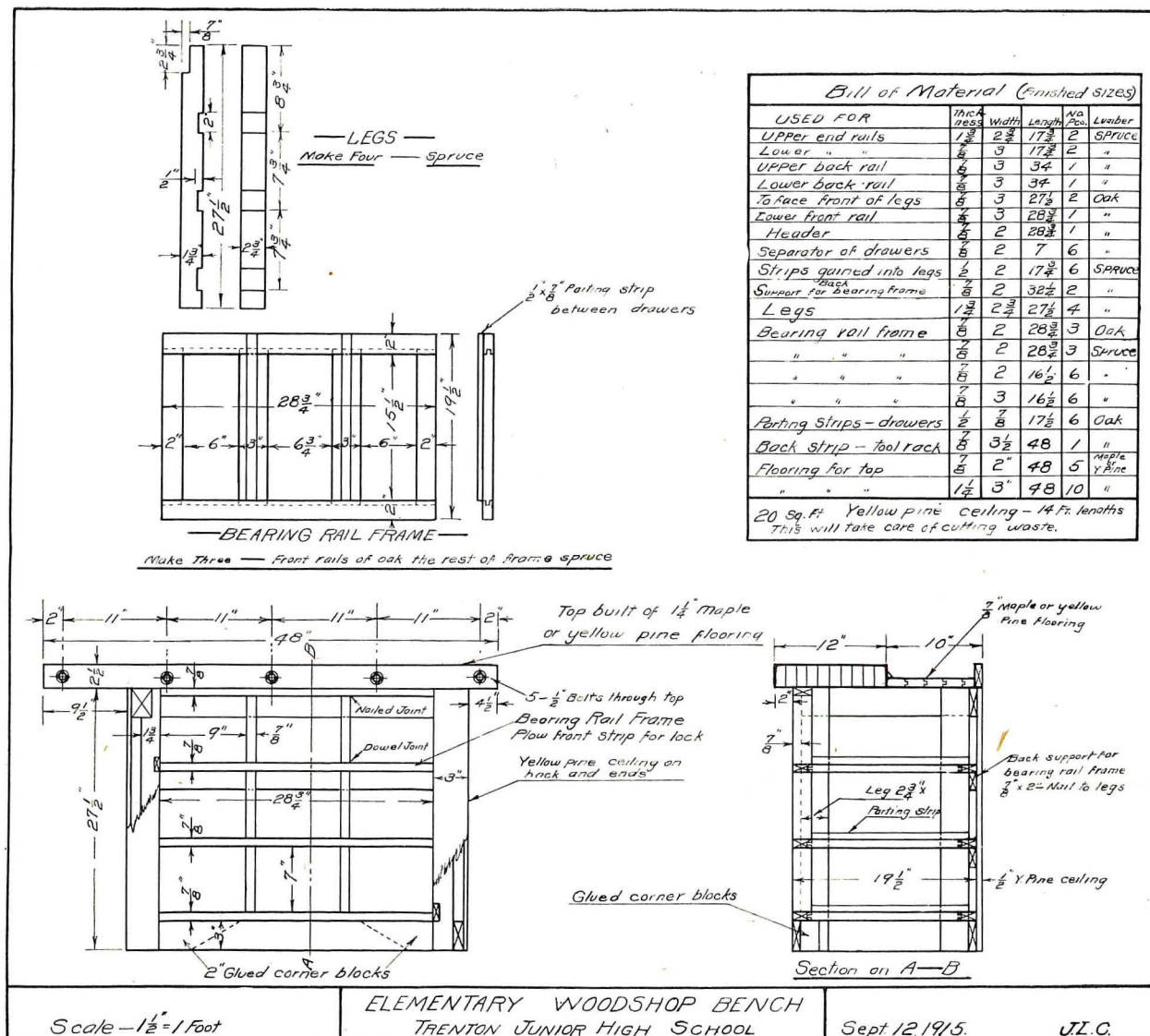
It was designed by the writer with the following aims in mind: Low cost, durability, good appearance, and the construction to be within the power of ninth grade boys.

The drawing desk was also schemed up by the writer and is a splendid project for first and second-year high school boys and we find it, for our purpose, superior to any desk we could have purchased.

The print shop stands do not differ much in design from the stands that are to be seen in most print shops, but are made much stronger.



Room Equipped with Benches Made by the Author's Students.



INDUSTRIAL-ARTS MAGAZINE

Board of Editors

WILSON H. HENDERSON Milwaukee, Wis.
E. J. LAKE Champaign, Ill.
S. J. VAUGHN DeKalb, Ill.

EDITORIAL

OUR NATIONAL BOARD AND THE BUREAU OF EDUCATION.

IT is hoped that the creation of the National Board for Vocational Education will mark the beginning of a new era in the national aspects of education in America. Heretofore, the National Bureau of Education has not been a great vital force, dominating or even vitally affecting the educational policy of the country. This is not said in a spirit of criticism but is merely the pointing out of a fact in order to emphasize the conditions that exist.

Our National Bureau has never had an appropriation equal to the school budget of a third class city. The commissioner is paid a salary equal to that of a superintendent in a town of 200,000 and the salaries paid his assistants are equal to that of a principal of a fair sized high school. The Bureau has had no authority to require that any standards be maintained in the educational institutions. Its only power has been moral suasion such as is asserted by official commendation. Under such conditions, it is surprising that the Bureau has been able, as it has, to command the respect of the educational forces of the country.

It has not, however, been in a position to initiate policies, to foster experiments, to reward achievements, and to take, in fact, the great educational leadership of the country. Instead, it has been in a very large degree a reviewing agency, publishing the results of the efforts of other people and institutions. This has been necessary, and in some cases effective work, but when confined to such duties, hardly worthy of the great national educational bureau of America.

Now comes the Federal Commission of Vocational Education with three appointive members, each with a salary equal to that of the Commissioner of Education. The law has placed in its hands several million dollars to be distributed to the states upon condition that they offer education of a type and standard to be determined by the commission. The commission has appointed a highly competent director and the machinery for administering the Smith-Hughes law has been set in motion.

The question in the minds of many is this: Will the Federal Commission on Vocational Education be a reviewing or will it be an initiating agency? Its composition, with three members who are also members of the President's cabinet and therefore sub-

ject to the uncertainty of the presidential elections, and with a fourth member subordinate to the Secretary of the Interior, makes a majority of the board directly responsible to the administration. This is not particularly reassuring for the future, altho its present personnel is quite fortunate, but there is no certainty as to what a day may bring forth in politics.

The board has made the best possible choice of a director and if it will recognize that this director is an expert and give him freedom to initiate policies and if Congress will not exercise the power given it by the law to reverse the decision of the National Board regarding federal aid to the states, all will be well.

It is evident that there are some achievements yet to be accomplished in federal legislation concerning education. One is the establishment of a *department* of education with the authority and the dignity that it should have and with a budget sufficient to pay salaries commensurate with the responsibilities and prestige of those administering it. Another is to eliminate the political element from the Smith-Hughes law.

RECREATION.

THE matter of suitable and effective recreation is important to the teacher whose work is sedentary and trying on the nerves.

In June the teacher has visions of complete relaxation away from the routine of school in some secluded nook where class bells and roll calls are never heard.

These visions of June are rarely realized.

Summer brings duties to the active mind and body no less than winter.

Fortunate is the teacher who has work for vacation that is a complete change from the school instruction. One month of nothing to do would drive an energetic soul crazy.

A notable teacher who is notorious among his friends for never taking a vacation was asked how he avoided growing stale. "By working and playing every day," he replied.

This is probably the best example of timely and effective recreation for the teacher. Let the day be the unit of measure for work and play rather than the year and the visions of June will vanish for the mind and body will be kept fit and trim.

THE GARY SURVEY REPORT DELAY.

SOME months ago we called attention to the fact that the report of the survey of the Gary school system was somewhat delayed. The survey was undertaken eighteen months ago and the report of the General Education Board issued in June, 1916, stated that the report would be published during the year. The report, however, has not come to light.

The Gary system has been the subject of so much discussion and has been so prominent that an evalua-

tion of its work as compared with that of other school systems would be of great value to the cause of education. The fact that the report is being withheld or delayed leads naturally to the supposition that there may be something in it which the General Education Board does not wish to publish.

If the General Education Board wishes to retain the confidence or even respect of school men, it will publish that report, even tho it condemns the entire school system of Gary. If the report is adverse to the Gary system, nothing will be gained by suppressing it. The rumors which have been circulated that this is true, will discredit not only the Gary school system, but every undertaking of the General Education Board.

It has also been suggested that the report is being withheld in order to influence the election in New York City, November 6th. In this connection, the only inference can be that the New York officials who have brought the Gary system to the city, are afraid for the facts to be known. Honest school men have always struggled to have the school free from politics and such a move as that suggested would set this movement back immeasurably. By all means, let us have the Gary report, regardless of what it may be.

TWO LESSONS ON GARDENING.

DURING the past summer *The Industrial-Arts Magazine* has emphasized the point that tho the demands of war would lessen the number of available teachers it would not lessen the number of children to be taught.

Perhaps our school officials have been gardening for the first time during the vacation. If so they have probably learned the first lesson of the amateur gardener, "*Don't plant too thick.*"

The best of seed and soil will not produce unless each small plant is given attention and room for development.

If the gardener is wise and industrious he can thin out the young plants in time to give some of them a chance to thrive.

Some of our American schools were planted too thick last year. They are planted thicker this year.

Unfortunately the teachers cannot thin out the crowded children which the false economy of school officials have planted too thick.

The teachers must make the most of crowded conditions.

If it is a wise father who knows his own son, how much wiser must the teacher be who knows the mental condition of each of his pupils in the crowded classroom and secures that individual response which is necessary to good instruction?

One other lesson we hope our school officials have learned from their summer gardening. *Each kind of plant requires special treatment.*

The children of a class cannot be treated alike with greater success than various kinds of vegetation.

Many of them need special treatment which present school conditions make impossible.

Our schools will not get beyond the formal routine which has become traditional until our school officials learn and apply these lessons on gardening.

QUALITIES DEMANDED IN AN APPRENTICE.

THE director of the apprentice school conducted by the Scovill Manufacturing Company, at Waterbury, Connecticut, lays down eight qualities which he demands in each apprentice. He explains these as follows:

Mechanical Ability is what a mechanic must have above all other things; it is the capacity to understand mechanical motions, as with levers, gears, pulleys, slides, cams, etc. The boy that can locate machine trouble without much delay has mechanical ability. He has it if he can grasp the working of a set of tools readily when it is explained to him.

Progress is the measure of the increase in ability as a pupil. Do you keep up with your studies and in their application?

Initiative means starting things without being told. Some of these days you will be thru school and at work somewhere, where you will be expected to accomplish things and where there will be no one around to tell you what to do first. You will have to start things yourself then—or lose your job. You'll have to have Initiative.

Steadiness means doing well every day and not only now and then.

Quality means the kind of work you do. Is it clean,—or sloppy?

Attitude means the way you look at things. Are you earnest, interested and attentive?

Ambition means the degree to which you show that you want to amount to something.

Application means the closeness with which you apply yourself to your work. Do it right and do it now is a good maxim to follow.

THE Federal Board of Vocational Education has chosen some of the strongest leaders in industrial education to organize its work. Director Charles H. Prosser has associated with him for a period of six months: Mr. Lewis H. Carris of New Jersey, in charge of industrial education; Mr. Layton S. Hawkins of Massachusetts, in charge of agricultural education; Mr. Charles H. Winslow of Indiana, in charge of research; Mr. Frank Thompson of Massachusetts, in charge of commercial education; and Miss Josephine Berry of Minnesota, in charge of home economics education. Regional directors to be located in Boston, Chicago, Denver, New Orleans, and San Francisco, are to be appointed shortly.

Economic selection is choice based solely on long-run least cost.—*J. C. L. Fish.*

CIVICS FOR APPRENTICES

R. W. Tarbell and John J. Metz, Apprentice Instructors,
Central Continuation School, Milwaukee, Wis.

The teaching of civics has undergone radical changes in the last few years. A glance at some of the second-hand bookshelves thruout the country reveals books on civil government, which deal with the legal mechanism of town, state, and nation, but say little of the relations of men as members of society. These older types of books, while good in their place, are not well adapted to the growing youth.

Present day writers in this field are laying stress on civic duties, rights and obligations, trying to develop a social esprit de corps, and teach how to be a citizen as well as the operation of government. Civics teaching is also being considered more from the point of view of the pupil, than of subject matter, and this results in a variation of treatment for different classes of people.

The American apprentice boy starts to learn his trade with an average education received in the eighth grade. He is not interested in the older type of civil government, but can be enthused by some of the newer ideas.

This article will attempt to show how the writers have developed a system for teaching this subject to apprentices in a large school.

For the past year we have tried a plan for teaching civics in a department where some 350 apprentices are enrolled. These boys are in attendance at school for one-half day each week and work at their trade the rest of the time. This makes about 35 young men in each half-day group. Being active in their habits they were interested in moving, progressing, lessons, and were particularly susceptible to the plan we pursued.

Each half-day group was organized into a club, with four officers in charge, president, vice-president, secretary and adviser. The duty of the president was to call the meeting to order, when the club was in session, go thru with the various forms of officiating, such as reading of minutes by secretary, new business, etc. The secretary read and recorded minutes, and other items as requested by the president. The vice-president and adviser, besides substituting for the first named officers, acted as tellers at elections, and were of general assistance.

Each club held a meeting every five weeks during the year, at a time regularly allotted to academic work, which usually lasted about forty minutes. A sample program is given here to show the nature of the work, all of which was in charge of the president.

Program for Class Club Meeting.

1. Call to order (by president).
2. Reading of minutes (by secretary).
3. Reading of class record showing attendance, work, etc. (by secretary.)
4. Nominations for new officers. (Submitted by vice-president and adviser.)
5. Balloting by club. (Different methods used for experience.)
6. Counting of ballots by tellers while suggestions and corrections are made by instructor.
7. Report of tellers announcing new officers.
8. Special number, such as talk by instructor, or assigned reading by a club member.
9. Close of meeting (by president).

There were enough meetings held during the year so that nearly every boy served in some capacity once. In only two or three cases were boys too timid to act, and the instructors deemed it discreet not to insist on their acting.

It must not be supposed that the apprentices were able to do this work effectually. It was necessary to have a well devised form for each to follow, especially for the president, who had the hardest job. On several occasions the president was in apparent confusion when he found himself in charge of a meeting, and needed coaching from the instructor. However, it is practically the unanimous testimony of all who have served, that it was good experience, and they would like to try it again.

There is some danger in work of this kind that a few in

the class will take advantage of a student in charge, and attempt to disturb the meeting. In reality this did not develop, as the instructor always remained in charge of the meeting above the president. The attitude of all the apprentices toward this kind of work was very commendable.

Thus far we have spoken largely of the part played by the class. Most of this was prefatory and formed a setting for the real lesson. Correcting mistakes made by the boys often developed into a helpful discussion. A significant feature of the lesson is that shown under number 8 in the program. Talks by the instructor were on parliamentary practice, good manners, duty toward employer, public elections, or what not. The instructors feel that the class was in an unusually receptive attitude during a meeting of this kind, and consequently at a high potential for teaching. Thus it is seen that the entire plan served as a vehicle for teaching civics, and was a laboratory for developing citizenship.

In conclusion let us point out some of the salient features. The work was decidedly worth while from the interest standpoint. All teachers know a lesson is a failure unless the interest is aroused. The boys had a chance to talk and express their opinions before others, thus developing self-reliance. The club fostered a class spirit, which is needed in our school the same as in a high school or university. The pupils, acting in various capacities, participated in class management. The experience gained will serve them in good stead when some of them develop into foremen.

More and more our schools teach by doing, instead of by abstract thinking. The awakened enthusiasm not only assists in teaching this particular subject, but is manifest in the entire school program.

POSTERS BY HIGH SCHOOL PUPILS.

Some three hundred Red Cross and Thrift posters were recently made by high school pupils of New York City, in a competition planned by the School Art League of New York City, under the chairmanship of Mrs. Laurent Oppenheim.

Dr. James P. Haney, director of art in the high schools, announced that any school where 25 or more posters were made by pupils out of school hours and without assistance, was eligible for three prizes, a five-dollar gold piece, a silver medal, and a bronze medal. As a result, fourteen high schools held exhibitions of from 25 to 50 posters. Three prizes and several honorable mentions were awarded in each school.

The prize-winning posters were then hung for a few days at the Washington Irving High School. Here the final awards were made by a jury, the chairman of which was Edwin R. Blashfield, president of the Mural Painters. The gold medal was given to a poster entitled "Do your Bit" by Abbie Dollin, of Erasmus High School, which shows a small boy leaning over a flower pot, where a diminutive plant is just sprouting. The silver medal was won by Thomas Beggs of Manual Training High School, for a poster entitled "Menacing War Clouds," wherein a farmer at work in the fields, suddenly sees a cloud whose outline reveals a marching army. The bronze medal was given to Andrew E. Buzzell, of DeWitt Clinton High School, whose appeal to "Help the Red Cross" was made by showing two Red Cross tents in the shadow of a ruined cathedral.

The 62 best posters were then exhibited at the Knoeller Galleries from July 11 to July 21. They attracted much favorable attention, both for the technical excellence of the work and the originality of the ideas, whereby these young people have expressed their patriotism. A number of posters are being reproduced for the use of the Red Cross, Mr. Hoover's Conservation Department, the Girl Scouts, and other organizations. Arrangements for purchasing these posters to be reproduced for patriotic purposes, can be made by communicating with the School Art League.

Traveling groups of posters have been arranged. One is devoted entirely to Red Cross subjects, another to Thrift

and Conservation, and a third, which is of special interest to teachers and art students, contains both subjects. Each group numbers from fifteen to 25 posters. These collections make a special appeal to those interested in the mobilization of our country's resources. Art societies and women's clubs doing patriotic service, will find these posters very useful in attracting attention to their work. To societies actively interested in furthering art work in the schools, the exhibition

will be for use in showing how the artistic talent of high school pupils may be mobilized in patriotic services. High school pupils and teachers will find it especially helpful in color and design. The posters are unframed and of uniform size, measuring 30x20 inches. These groups of poster designs may be secured for exhibition by communicating with Miss Florence N. Levy, Secretary of the School Art League, 215 West 57th St., New York City.

WHY TEACH DRAWING?

J. L. Long, Chicago, Ill.

In a certain city the treasury of the public schools was somewhat overdrawn at the close of the year, tho not alarmingly so for a city of such resources. On the Board of Education was a conservative business man who felt the unwise policy of closing the year with a deficit. He contended that drawing and music were fads and that by dispensing with these departments the salaries of the supervisors could be applied on the deficit.

In talking with the Superintendent, who had occasion to call at his office, he was telling of a visit he had made to one of the schools and of certain changes he thought should be made in some detail about the building. This was within the purview of his duty as chairman of the committee on buildings and repairs. He had some difficulty in making his suggestion clear, and, finally, he reached across his desk and picked up a tablet, remarking, "Let me have some paper. It seems that I can't make myself understood unless I have a pencil and a piece of paper."

The Superintendent said, "Now, Mr. M——, I'm glad you made that remark. You never had an opportunity to learn to draw—to express yourself thru the medium of a pencil sketch. You admit that you cannot get along without this method of expression, crude tho your drawings may be. Notwithstanding your own experience, you say drawing is a fad, and you propose to take away from the school children the opportunity to learn what you admit you cannot get along without." He replied, "Well, I suppose you are right about that."

The trouble with Mr. M—— had been that he thought that the object of a school drawing course was to make artists or near artists of the pupils. While such a purpose would indeed be high and praiseworthy, it is not within the scope of school drawing. Ability as an artist, in the sense of paint brushes and canvas, is, to a large extent, a gift of nature, which, to produce a master, must be given years of uninterrupted, intensive cultivation under unusual conditions. School drawing may, of course, discover the exceptionally gifted individual. Yet, its real object is far broader, in that it applies to the average pupil under average conditions, and gives him skill which may be practically applied in many fields, apart from "art" in its restricted sense. Comparatively few of us, indeed a very small per cent, ever touch an artist's palette, but most of us have need almost daily of the application of those principles which are included in the usual school drawing course.

Drawing, as a subject of study in school, falls far short of its real value if it is made an *end* rather than a *means*. Taught as an end, it functions in the development of *artists*. Taught as a *means*, it functions in the development of *artisans*. Of *artists* there are comparatively few, as has been stated. On the other hand, there are *artisans* without number, and the demand for intelligent, skilled artisans is unlimited.

Indeed, there is not a teacher, a silversmith, a printer, a milliner, a dressmaker, a tailor, a carpenter, a cabinet-maker, a machinist, a plumber, a paperhanger, a builder, an engineer, a saleswoman, an embroiderer, a shipping clerk, an electrician, a real estate salesman, a contractor, that would not find skill in drawing of surpassing value in increasing his potency in his vocation.

In certain of these callings a sense of correct proportion, and an appreciation of design, which comes thru a good course in drawing, are especially desirable and helpful. indeed, this is true in almost every activity that calls for intelligence, originality or initiative.

Drawing enriches the mental content and makes a more intelligent artisan. His ability to use a pencil, to sketch what

he has in mind, and thus make himself understood, makes him more intelligible, more forceful, more efficient. For instance, an expert printer submitted in our office the proof of a circular he was preparing to print for us. He is a good printer and he had set up the matter in neat form. A young man of the office, however, who happened to see the proof, remarked, "I wouldn't arrange it that way;" and with his pencil sketched hurriedly the outline of a cut which we had, and indicated the arrangement and style of the headlines. His suggestions were immediately recognized as a decided improvement and the printer adopted them. After the young man went away, the printer remarked, "If I could use a pencil as that young man can, and show what I have in my mind, I could land ten big printing jobs to every one that I now succeed in landing."

The above illustration suffices to show how skill in drawing may enter into the success of those in almost any avocation by increasing their efficiency and, consequently, their earning power. Indeed, no other subject in the school course can be made to more effectively reinforce one's efforts and to supplement and illumine one's arguments.

Yet, in emphasizing the importance of drawing from a commercial standpoint, it must not be understood that such training is valued only by the money which it may earn. Surely, there are cultural values in school drawing which cannot be measured in dollars and cents. It shows its refining influence in the home itself, and in the care, beauty and orderliness of its premises. It creates an interest in home and a desire to improve home conditions, as does probably no other subject in the school curriculum. It fosters "home ties," and leaves a cherished record of one's childhood handiwork.

Drawing has another cultural value in that it teaches discrimination and good taste in the selection of colors and designs in rugs, in drapery, in wall paper and in personal attire. It exercises a controlling influence in the selection of furniture and its arrangement within the home. In other words, drawing, properly outlined and taught, not only adds to one's practical, bread-winning power, but it also tends toward the inducement and establishment of that restful, peaceful atmosphere in the home that means so much in the culture, refinement and joy of its occupants.

Cleveland is surely committed to the Junior High School idea. With the opening of schools in September, nine such schools are in operation with a total attendance of nearly 4,000, and the schools offer literary, industrial and commercial courses, and all teachers have four hours each week of industrial work. Those who elect the industrial course in the middle of the first year will receive ten hours of industrial work each week.

The industrial courses for boys consist of woodworking, concrete work, printing, book binding, cabinet making, metal work and electrical work. The girls receive instruction in domestic science and domestic art. Much of the work will be productive in character.

It is planned to open additional Junior High Schools in the future, and they will eventually cover the work of the present elementary industrial schools, as well as of the so-called manual training centers. The Board of Education is contemplating the establishment of industrial trade schools.

Three of the teachers of manual training in the Cleveland Schools who were given leaves of absence by Supervisor W. E. Roberts to attend the first training camp of the Officer's Reserve Corps have received commissions. Another teacher is in attendance at the second camp, and four have entered another branch of the military service.

PROBLEMS AND PROJECTS

The Department of Problems and Projects, which is a regular feature of the INDUSTRIAL-ARTS MAGAZINE, aims to present each month a wide variety of class and shop projects in the Industrial Arts.

Readers are invited to submit successful problems and projects. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing and a good photograph. The originals of the problems in drawing, design, etc., should be sent.

Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are eligible for consideration.

Drawings and manuscripts should be addressed: The Editors, INDUSTRIAL-ARTS MAGAZINE, Milwaukee, Wis.

CENTER STAND.

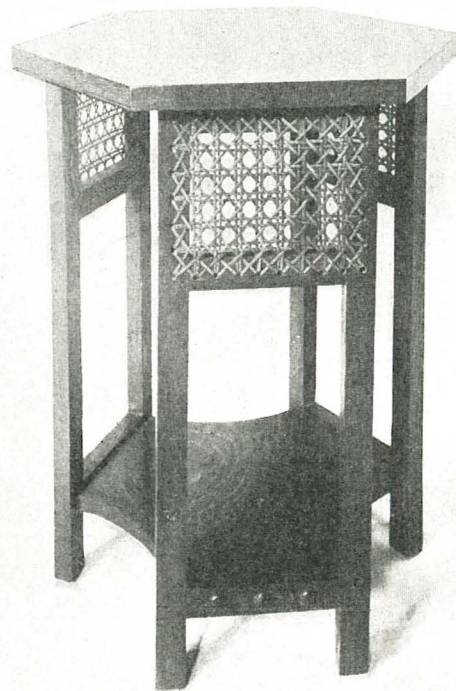
L. Day Perry, Supervisor Manual Training, Joliet, Ill.

In this stand mortise and tenon and dowel joints are employed. The mortise and tenon joint is used in the framing, and the dowel in assembling. Screws may be used as indicated, in attaching the shelf. The countersunk holes may be capped with wood buttons. A piece of wood cut slightly smaller than the shelf is screwed to the under side of the top, and the uprights are doweled to this, thus securely fastening the top to the base.

This stand is hand caned, and is more effective than if panels of cane webbing were inserted. The detail of a corner on the drawing gives the proper dimensions for medium cane. The holes in back should be countersunk slightly so the caning may be made easier and the work neater. The exposed cane ends may be covered with a thin strip of wood thru which a shallow groove has been run. If the cane ends have been bound well the covering is not necessary, for the ends are pretty well hidden behind the structure.

Modifications in dimensions up to a height of thirty inches with a corresponding increase in width to retain proportion, are very proper in a stand of this description.

The stand shown in the photograph is made of quartered oak, is fumed, and finished with shellac and wax. The caning may be done before the stand is placed in the fuming box, for ammonia will not permanently change the color of cane. If the worker desires the cane colored it is good practice to stain the entire stand rather than fume it.



CENTER STAND

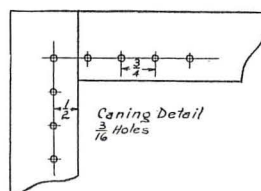
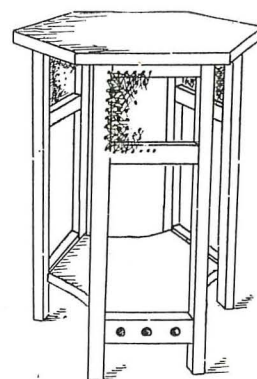
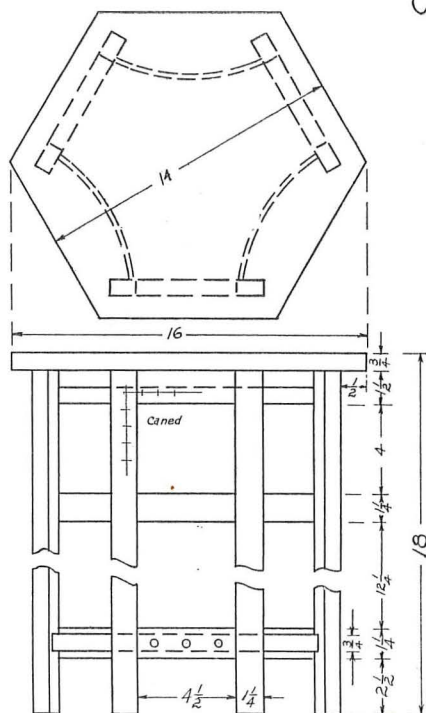


TABLE LEG SCREW PRESS.

The table leg screw press, shown in the photograph, was made during the last school year in the shops of the Oklahoma Agricultural and Mechanical College, Stillwater, Okla. The machine was designed by DeWitt Hunt, Superintendent of the shops, and the machine work was done by the engineering students under the direction of F. R. Bradley, machinshop instructor. The castings and forgings were produced by classes under the direction of E. E. Brewer.

A similar machine, if bought from a manufacturer, would cost approximately \$100 plus freight. The machine illustrated was made at a total cost of \$19.70. The expense was divided about as follows:

200 pounds pig iron.....	\$ 8.00
8 1" hexagonal nuts.....	1.60
39 $\frac{3}{8}$ " ball bearings.....	1.50
Steel for rods, etc.....	5.00
6 $\frac{1}{2}$ "x2" cap screws.....	.60
Material in patterns.....	3.00

\$19.70

It is planned during the next school year, to make several of these machines for high schools in Oklahoma. Castings will be made and furnished at a reasonable price to schools that have machine shops.

By using scrap oak or soft wood for cores and $\frac{1}{8}$ " veneer, table legs may be glued up in this press with perfect glue joints. The wood should be pre-heated and hot glue should be used.

The ratchet wrench was designed especially for this press. The handle must not be more than 12" long and only a medium force exerted. With a 24" handle and a strong pressure one top casting was broken.

FOLDING IRONING BOARD.

Designed by Y. E. Smethurst, Mechanical Drawing Instructor, San Bernardino Polytechnic High School.

This board was originally designed as one of the built-in features of a bungalow. The general external appearance was made to conform with design and finish of woodwork in the kitchen where it was installed.

The vertical dimensions are such that the head casing and mould correspond with those of the windows and doors.

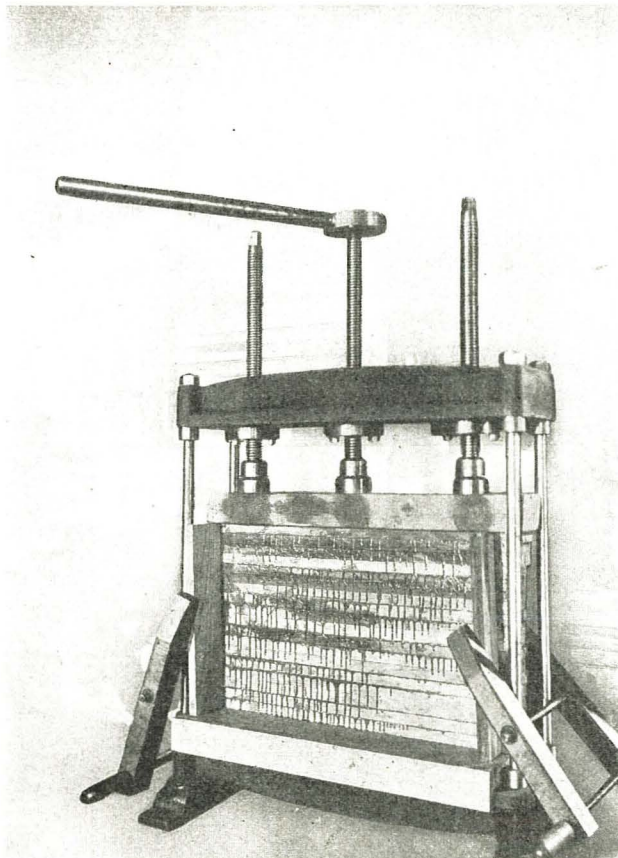


Table Leg Screw Press.

This project when properly made covers a variety of operations in joinery and millwork, giving an opportunity for the demonstration of practical shop methods.

Oregon pine can be used for the exterior where finished

RATCHET WRENCH FOR TABLE LEG SCREW PRESS.

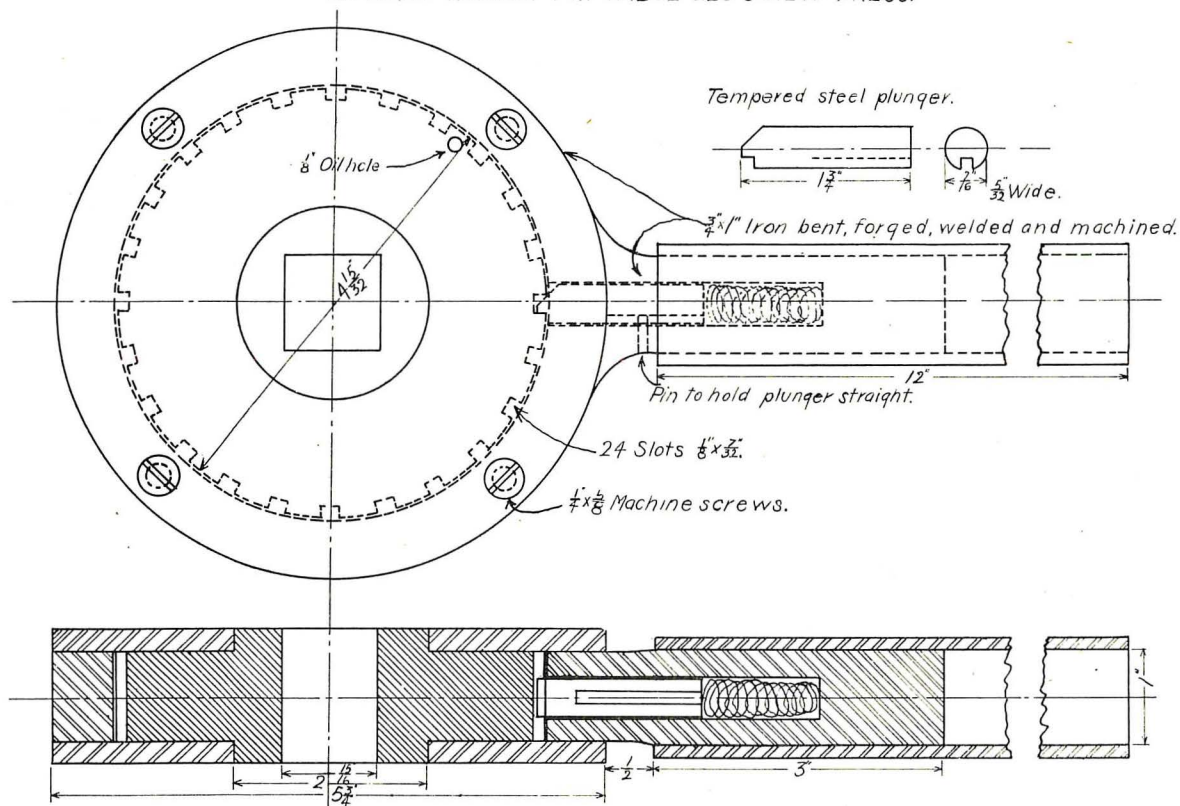
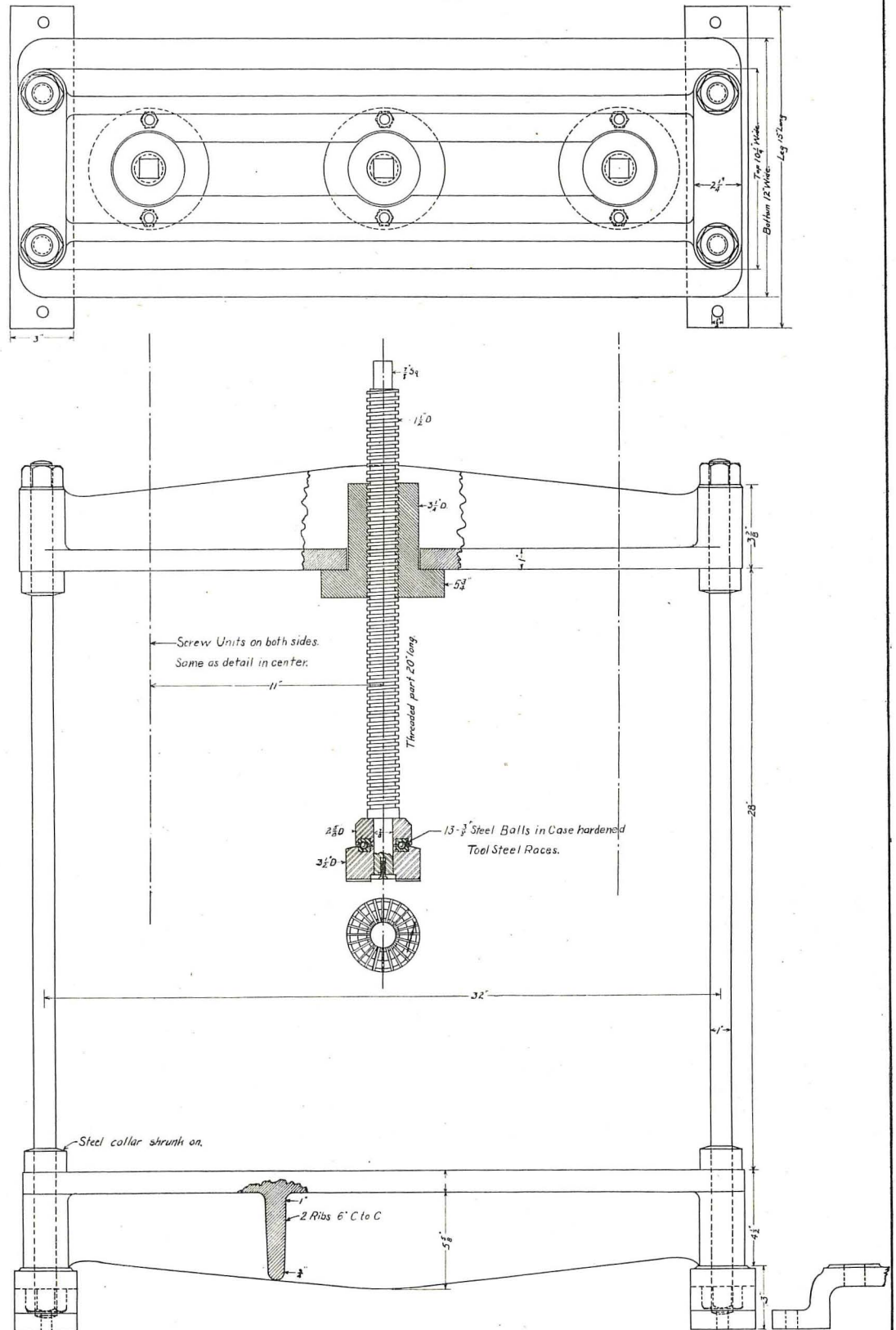
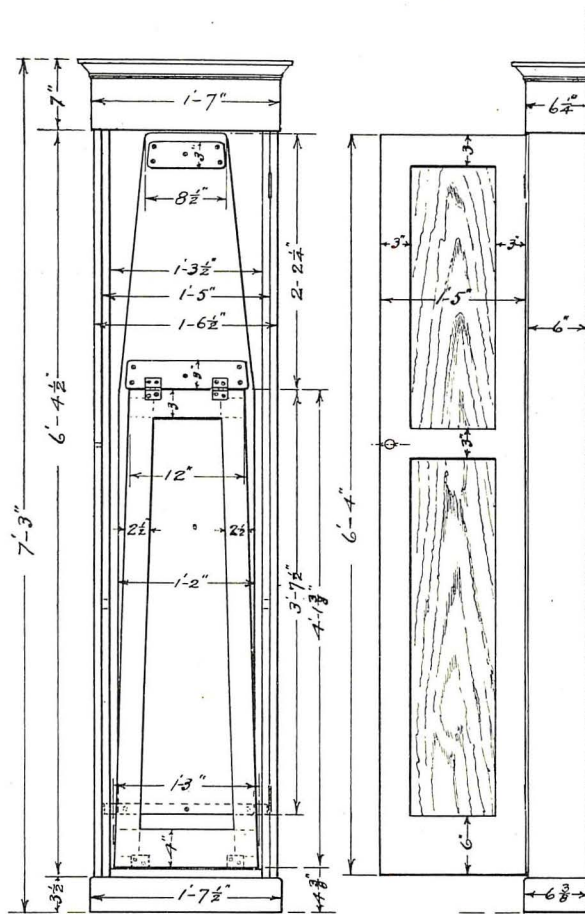


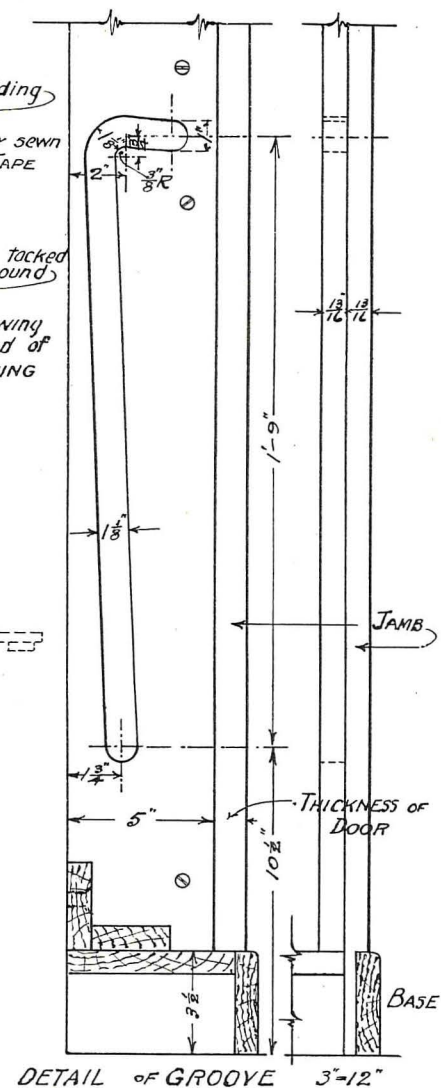
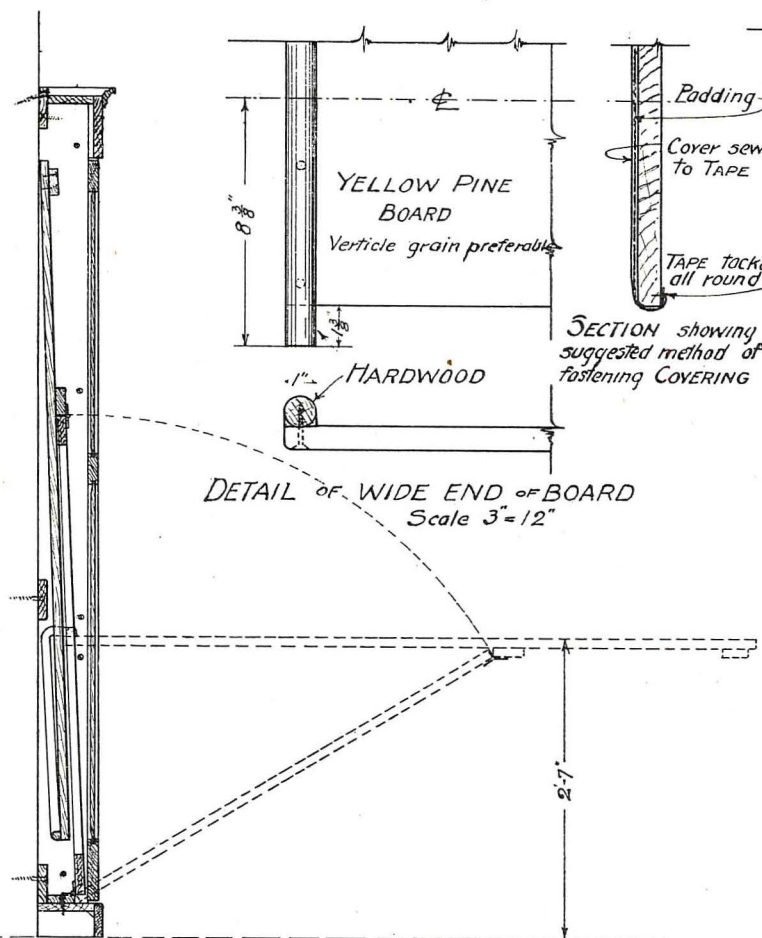
TABLE LEG SCREW PRESS.



DETAILS OF TABLE LEG SCREW PRESS.



Scale of FEET in inches



natural; if enameled, yellow pine is easier worked and just as serviceable.

Material List.

Door. 1 piece $1\frac{1}{4}'' \times 8'' \times 10' 0''$. (Cut off $1' 6''$ for bottom rail, rip up center of remainder for stiles, top and lock rails.)
1 piece $\frac{1}{2}'' \times 10'' \times 5' 6''$ (for panels).

Bracket. 1 piece $1'' \times 6'' \times 8' 0''$. Saw off $4' 2''$ and rip for sides, then saw off $2' 4''$ for top and bottom rails, the remaining piece will do for the top of case.

Case. 1 piece $1'' \times 12'' \times 14' 0''$. To be ripped with a variation in width equal to thickness of door for inside and outside jambs.

1 piece $1'' \times 12'' \times 6' 0''$. To make head casing, base, bottom, and cross pieces (to fasten case to wall).

1 piece $1'' \times 2\frac{1}{2}'' \times 3' 4''$ picture mould.

Board. 1 piece $1'' \times 14'' \times 6' 0''$. Pieces from side to make battens.

1 piece $1'' \times 1'' \times 1' 6''$ hardwood.

Hardware. (See bottom of directions.)

Directions.

Reduce all pieces to finished dimensions shown on drawing.

Door—Make groove in one edge of each stile, top, bottom and both edges of lock rail, to suit thickness of panel. Mark off and cut mortises. Make tenons to fit. Cut and fit

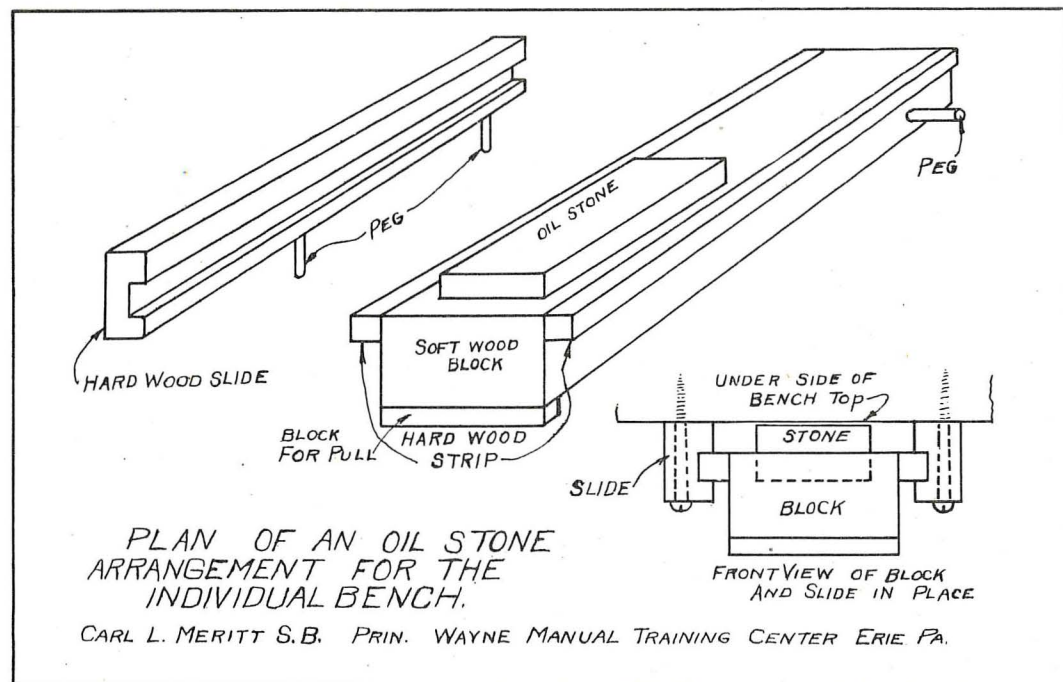
PLAN OF AN OIL STONE EQUIPMENT FOR THE INDIVIDUAL BENCH.

Carl L. Meritt, Erie, Pa.

The plan here shown has proven a valuable addition to the bench equipment in the Wayne Manual Training and Vocational School at Erie, Pa. The grade boys did a large share of the work.

Thru the past four years of experience in teaching shopwork, I have been looking for some way to get results in having the boys care for the whetting of their chisels and plane blades. At last I persuaded "the powers that be" to furnish an oil stone for each bench, but no sooner were they in the shop than I found them a nuisance in one way, which was, that they littered up the bench top so that the boys always put them on an empty bench, if there was one, to get them out of the way during work. In my study to overcome this, I hit upon the above plan which I had never seen used and which I should like to pass on if it may be of use to anyone else in solving the sharpening problem.

The block of softwood is about twice as long as the oil stone so that when the block is pulled out from under the bench for use, there is about as much left under the bench in the slide as there is out, giving a good support to the stone while in use. The slide and the strip fastened to the block,



panels. Clamp up before gluing to see if all joints are perfect. Glue, then finish.

Bracket—Mark off and make mortise and tenons. Clamp together, making sure that both sides form the same angle with bottom. Glue and when set, finish.

Case—Make sure inside and outside jamb vary in width equal to thickness of finished door plus $1-32''$ for clearance. Place inside jambs back to back, lay on groove from detail, also position of cross pieces—which are afterwards screwed into these recesses and work both together. Rabbet outside jambs at top and bottom to make projections as shown. Miter head casing, mould and base. Assemble case.

Board—Mark off and work to sizes. Screw on top batten, then piece of hardwood with rounded pins. Place board in position when up. Lay bracket in horizontal position, screw on bottom hinges, raise bracket to lean against board, screw batten about $1/16''$ above top of bracket, put on hinges.

Fit and hang door.

Hardware.

1 pair $2'' \times 2''$ loose pin hinges (for door).

1 barrel bolt or cupboard catch (for door).

2 pairs $1\frac{1}{2}'' \times 2''$ butterfly hinges (for bracket).

3 doz. $1\frac{1}{2}''$ No. 12 flat head bright wood screws.

About 1 doz. $6''$ finishing nails (for base and head casing).

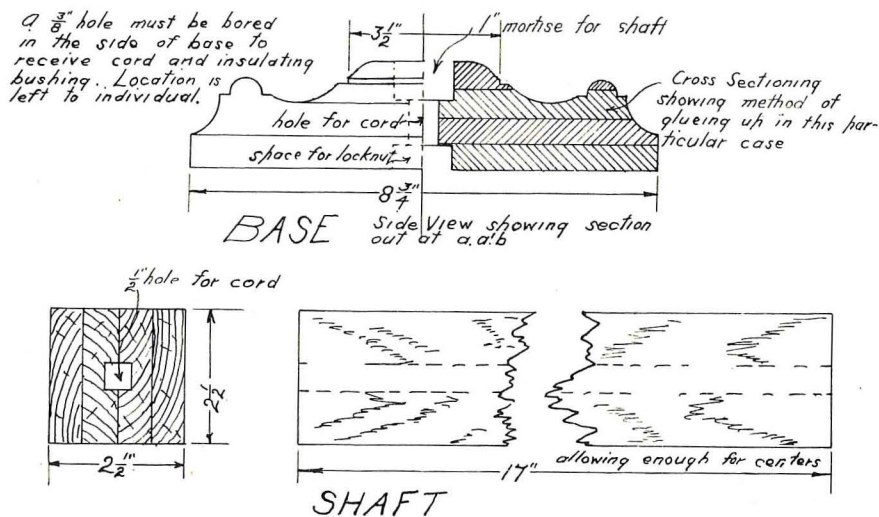
as will be seen, are made of hardwood for strength and wearing qualities. The block is made of softwood, in this case gum, on account of cheapness and ease of working.

The pegs shown in the drawing, in the side of the block and in the under side of the slide, act as stops. Of course the peg in the block would, of necessity, be in the same side of the block as is held by the slide containing the pegs, so that they work together. The dimensions of the block vary with the stone. I allowed $\frac{1}{2}''$ on each side and in front of the stone. The hardwood strip was $\frac{3}{4}''$ square, as long as the stone block, and the slide was $\frac{3}{4}''$ thick, $1\frac{1}{2}''$ wide and as long as the bench is wide. The groove in the slide was $\frac{1}{2}''$ wide, $\frac{1}{4}''$ deep and was cut $\frac{1}{2}''$ from the upper edge of the slide. The slides are fastened to the under side of the bench with heavy screws.

I find the boys a little better pleased with the benches having this convenience and they are more willing to sharpen up if they have things handy. Altho my experience with this equipment has been short, I consider it a distinct asset to the shop and should be loath to part with it.

I believe every boy should be taught to whet his own blades as soon as he starts shopwork. The only way to accomplish this is to have an oil stone at the disposal of every boy and give some lessons in sharpening when the whole class takes time off and sharpens up under the close super-

DETAILS



Details of Base and Shaft of a Turned Table Lamp.

vision of the instructor. This arrangement of the oil stone gives every boy a stone at his elbow when he needs it and it is readily put out of the way when not in use.

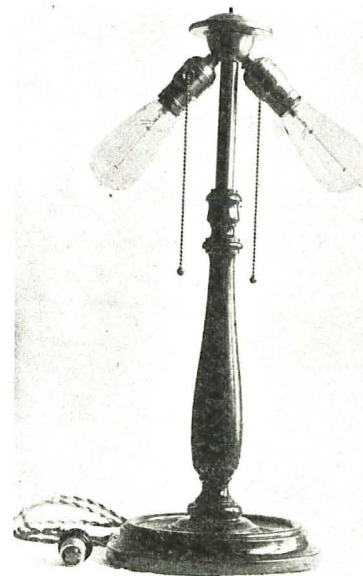
A TABLE LAMP.

Percival Angove, Ionia, Mich.

How to make a desired article from a piece of lumber which is beautiful in grain but too small in dimensions constitutes a difficulty which frequently confronts manual training teachers. The construction of the accompanying project formed such a problem.

The board from which this lamp was made had served as a walk in a muddy backyard and was brought into the woodworking class by a pupil. After running it thru a planer it was found to be an exceptionally good piece of black walnut which, when properly dressed, made a board approximately 1"x16 $\frac{1}{2}$ "x72". To turn out a table lamp from this piece involved a good problem in matching and gluing. It afforded also an opportunity for the correlation of applied design, mechanical drawing, shopwork and simple wiring.

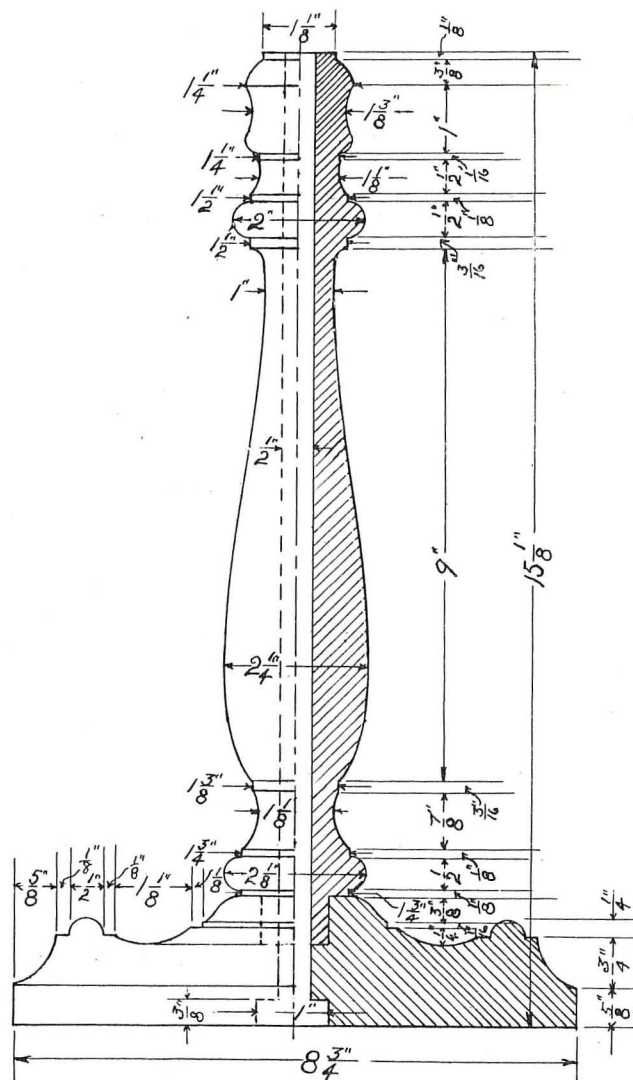
The Base. Four pieces larger than the finished project were taken from the board, carefully matched and marked to avoid mistakes in gluing. To assure a stronger job, the surfaces to be glued were roughened by scratching. The pieces were then glued as shown in the detail drawing, clamped and allowed to stand over night. After marking the outer circle with a pair of dividers, the piece was roughed out on a band saw, after which it was fastened to a face plate. The ordinary principles of face plate turning were used, cutting the mortise for the tenon of the upright with a three-eighths-inch chisel. The face plate was not removed until the lamp had been completed, in order to avoid off centering.



The Upright. Great care in matching was taken in selecting the four pieces 1"x2 $\frac{1}{2}$ "x17" required for the upright. Exactly the same method in gluing was used as for the base. Before proceeding with this, a groove $\frac{1}{4}$ "x $\frac{1}{2}$ " was cut in the center of the two inside pieces to leave a hole one-half inch square for the cord. (See detail drawing.) The holes were plugged on each end with hardwood. The piece was then placed between centers in the lathe with the top of the upright toward the tail stock and turned to the required dimensions. It is well not to cut away the waste wood on the top part of the upright until the gluing and finishing have been completed in the lathe. By gluing in the lathe, a well clamped, firm and accurate project is insured.

Finishing. The project was finished in the lathe by sandpapering, filling and polishing with shellac and olive oil. The touch of olive oil was used to eliminate the tendency of saging. A tint of mahogany stain may be added to the walnut to give it a richer effect.

Fixtures. The electrical fixtures which may be purchased of any local dealer are held in place in a gas pipe which runs thru the base and spindle of the lamp and projects six inches above the top. It is threaded at both ends and is kept in place by means of a lock nut screwed on the bottom. The projecting end at the top is covered with a piece of brass tubing. It is well to bore a $\frac{3}{8}$ " hole in the side of the base to receive an insulating bushing.



NOW, ARE THERE ANY QUESTIONS?

This department is intended for the convenience of subscribers who may have problems which trouble them. The editors will reply to questions, which they feel they can answer, and to other questions they will obtain replies from persons who are competent to answer. Letters must invariably be signed with full name of inquirer. All questions are numbered in the order of their receipt. If an answer is desired by mail, a stamped envelope should be enclosed. The privilege of printing any question and reply is reserved. Address, *Industrial-Arts Magazine, Milwaukee, Wis.*

Problem in Mechanical Drawing.

646. Q.—Will you please tell me how to construct a septagon and a nonagon?—*R. H. F.*

A.—General methods will be found on pages 39 and 40 of Frank's Essentials of Mechanical Drafting (Milton Bradley Co., Springfield, Mass.)

Finishing Birch and Cherry.

683. Q.—Can you give me good methods for finishing birch and cherry? I have several students in my classes who are using birch and cherry and who desire mahogany and deep cherry finishes.—*L. J. P.*

A.—Regarding the treatment of cherry as requested by your correspondent, this has always been wood regarding the treatment of which I have had marked personal preferences which do not in any way incline toward the scarlets or reds which seem to have been developed on this wood by a few firms in the past. I much prefer the development of an overstain of brown thru which the natural red tint of the wood shows in an unobtrusive manner. A successful treatment of this wood can be obtained thru the use of a solution of bichromate of potash at the rate of two ounces of the salt in one gallon of boiling water. The strength of the solution may be increased up to four ounces of the salt to the gallon, but beyond this point no further additions should occur due to the fact that the excess salt will tend to crystallize out, thereby destroying the standardization of the solution.

Very beautiful browns can be produced on almost any wood thru the use of an iron salt and an alkali used as two separate solutions in two different applications. For instance, ferric chloride, which may be obtained as a standard solution in any drug store as tincture of iron, may be used in a stock solution at the rate of one ounce of the tincture to one gallon of water. The use of this particular iron salt in this form will overcome the difficulty of preparing a standard solution at any odd time since the U. S. P. prescribes the strength of this solution no matter where it may be bought in the United States. The standard solution of one ounce to the gallon of water may be brushed on to the sample and allowed to dry, after which the alkaline solution should be applied and allowed to stand twenty-four hours. This solution may be made by adding two ounces of crystallized sodium carbonate (sal soda) C. P. to one gallon of boiling water. If it is desired to increase the color, the ferric solution should be changed first as there is more than enough alkali in solution 2 to neutralize quite an excess of the acid salt.

It is best to sponge the work before the use of water stains, followed by thoro sanding after drying. I would also recommend that the wood be sanded between the iron and alkaline solutions in order that perfect smoothness of the wood may precede the application of the varnish. A wood which contains such fine pores as does cherry need not be filled. It should, however, be coated with very thin shellac so as to form a surfacer and prevent the absorption of the varnish. It is sometimes desirable to liven and soften this brown color thru the use of a very small amount of bismark brown, dissolved in alcohol and added to the shellac until it is tinted a slight red. After this thin shellac coat has dried, sand free from tooth, dust off, remove to a dry and warm varnish room and coat with good varnish, well brushed out. This should be allowed to dry one week, sanded perfectly smooth with 00 paper and given a second coat in full body. If desired this may be followed by a third and fourth coat, which last should be rubbed down with an F pumice stone, felt pad and water until a perfectly smooth and level surface, free from tiny nibs or humps, is obtained. The work should be well sponged off with clear water, excess pumice stone cleaned out of the corners with a brush, the whole piece dried with a chamois and then cleaned with a good oil polish.—*Ralph G. Waring.*

Wood Carving.

697. Q.—Please give me the name of a concern where I can get wood carving designs or ideas on wood carving.—*G. N. A.*

A.—The following books will be found helpful: *Woodsend's Practical Wood Carving*, \$1, Building Age Book Dept., New York; *Rowe's Practical Wood Carving*, \$3, Manual Arts Press, Peoria, Ill.; *Hasluck's Wood Carving*, \$2, David McKay, Philadelphia; *Hodgson's Easy Lessons in the Art of Wood Carving*, \$1.50, Munn & Co., New York; *Jack's Wood Carving*, \$1.40, D. Appleton Co., Chicago, New York.

Finish for Laboratory Table Tops.

698. Q.—The Manual Arts Department is making a set of tables for the biological room. We want to finish the tops similar to the method used on chemical tables. Will you please inform me of the method used?—*R. V. L.*

A.—The following formula is used by several universities:

Solution A—Crystallized copper sulphate, 125 grams; Potassium chlorate, 125 grams; Distilled water, 1 liter. Boil in porcelain or glass dish until both salts are dissolved.

Solution B—Aniline oil, 125 cubic centimeters; Cone. hydrochloric acid, 175 cubic centimeters; Distilled water, 700 cubic centimeters.

Clean the table of dirt or varnish down to the wood and apply with brush two coats of solution A, putting the second on as soon as the first one is dry. Put both on boiling hot. Now apply two coats of solution B and allow to dry thoroly. With a piece of cheese cloth apply a very thin coat of raw linseed oil. When thoroly dry, wash off excess of oil and stain with boiling hot soap suds. This treatment leaves the tables with a dull black finish which will resist acids and alkalies for years.

The following formula is used by Harvard University:

First coat. 125 grains copper sulphate powder, 125 grains potassium chlorate, 1 liter of water. Heat in steam bath or double kettle in glass or porcelain vessel till dissolved. Apply one coat hot with clean brush.

Second coat. 150 grains of aniline hydrochlorate, 1 liter of water. Dissolve same as above. Apply three coats with a clean brush, each coat to become thoroly dry before applying next. Color will become green when first applied, but in several days will turn a dead black. Allow material to thoroly dry and wipe bench tops with linseed oil. The above quantities will cover about five square yards.

Finishes for Oak.

700. Q.—I would like to have you tell me where I can get information on the different shades of stains that are used, especially for golden oak and fumed oak.—*C. W. S.*

A.—Explicit information for making the different shades of stains for oak may be found in Schmidt's "Problems of the Finishing Room," \$5, and in Kelly's "The Expert Wood Finisher," \$3. A good deal of information can also be found in the articles by Mr. J. M. Dorrans in the Magazine for April, October, and December, 1916, and in the Questions and Answers Column, Q. No. 368, April, 1916, and Q. No. 486, July, 1917.

Books on Patternmaking, Etc.

702. Q.—Can you suggest articles in back numbers of your magazine on patternmaking, foundry work, forging, machinshop work, also on pottery and clay products. I will be interested too if you can point me to articles on development of power—I believe I have seen drawings and descriptions of simple motors in your magazine.

If you can suggest elementary texts on any of the foregoing subjects I would be glad to hear of them.—*F. S.*

A.—See indices for articles published in the *Industrial-Arts Magazine*.

The following are leading elementary texts in the subjects named.

Pattern Making.

Purfield's Wood Pattern Making, \$1, Manual Arts Press; *Ritchey's Pattern Making*, \$1.50, The American Technical Society, Chicago; *Wilson's High School Course in Wood Pattern Making*, \$0.80, M. E. Smith, Washington, D. C.

Foundry.

Gray's Foundry Work, \$1, The American Technical Society, Chicago; *Payne's Founder's Manual*, \$4, D. Van Nostrand, N. Y.

Forging.

Horner's Practical Iron Founding, \$2, Van Nostrand, N. Y.; *Googerty's Practical Forging and Art Smithing*, \$1.08, Bruce Publishing Company, Milwaukee; *Harcourt's Elementary Forge Practice*, \$1.50, Stanford University Press, Stanford, Cal.; *Schwarzkopf's Forging*, \$1.50, John Wiley & Sons, New York; *Ilgen's Forge Work*, American Book Company, New York.

Machine Shop.

Watson's Shop Problems, \$1, Casino Technical Night School, Pittsburgh, Pa.; *Colvin and Stanley's Machine Shop Primer*, \$1, McGraw-Hill Company, New York; *Zerbe's Mechanics for Boys*, New York Book Company, New York; *Amateur Mechanics*, Popular Mechanics Company, Chicago; *Smith's Elements of Machine Work*, \$2, Industrial Book and Equipment Company, Indianapolis, Ind.

Pottery and Clay.

Adam's When Mother Lets Us Model, \$0.75, Moffat, Yard & Company, New York; *Clay Modeling and Printing Book*, \$0.65, Whitman Publishing Co., Chicago; *Lester's Clay Work*, \$1, Manual Arts Press; *Sargent's Modeling in Public Schools*, \$0.70, School Arts Publishing Co., Boston; *Webb's Pottery Making*, Lewis Institute, Chicago; *Cox's Pottery*, \$1.32, School Arts Publishing Co.; *Jervis' Pottery Primer*, \$1, Munn & Company, New York; *Hall and Perkins' Handicraft for Handy Girls*, \$2, Lothrop, Lee and Shepard, Boston; *Binns's Potter's Craft*, \$2, D. Van Nostrand.

Fret Work.

703. Q.—(a) Is there an American weekly or monthly pamphlet which would be helpful to a boy clever at fret work? (b) Could composition board be used instead of wood for fret or scroll saw work?

A.—(a) There is no American publication that deals with fret work. None of the boys' publications regularly contain designs. (b) Beaver board may be used for fret work, and coping saw work. In fact, the manufacturers of this board make a line of children's toys known as Beaver Beasts which are very similar to the best type of coping saw work done in elementary schools. The material is supplied with a surface that is sized and sealed against moisture and can be made even more rigid if it is dipped in a cheap varnish before or after it has been cut with the saw.

Period Furniture Ornaments.

704. Q.—Will you kindly give me the address of one or more firms manufacturing ornaments suitable for use on period furniture?—R. W. J.

A.—*Furniture Ornaments.* Syracuse Ornamental Co., Syracuse, New York; Decorators Supply Co., Archer Ave. and Lime St., Chicago, Ill.; Zeeland Ornamental Co., Zeeland, Michigan.

Furniture Hardware. The Grand Rapids Brass Co., Grand Rapids, Mich.; Noblit Bros. & Co., Philadelphia, Pa.

Furniture Catalogs.

705. Q.—Will you please give me the names of firms which issue furniture catalogs? I desire catalogs containing illustrations, dimensions, etc., from which designs can be copied.—Various subscribers from Maine to California.

A.—The above question is a composite of requests that have reached us during the past year from subscribers in all parts of the United States. Unintentionally, we think, it involves an unethical practice that teachers should not engage in.

The furniture trade is so organized that catalogs and pamphlets are available for distribution only to established jobbers and dealers. The catalogs are usually very expensive, varying in cost from fifty cents to five dollars or more, and

cannot be sent to others than dealers without a violation of trade ethics and, in some instances, positive trade agreements.

Catalogs are selling instruments and it is not fair for a teacher to request one if he is not an intending, or at least a potential purchaser. It is especially unethical to ask for a catalog to copy the designs found there. Certainly there is no objection if the teacher frankly writes to the manufacturer his intentions. But if he gives no clue to his intention or conveys a wrong impression, he is doing the manufacturer a two-fold injury. He is causing a direct money loss to the extent of the cost of the catalog and he is appropriating without permission, or compensation, one of the furniture manufacturer's most important items of trade and good will—his designs.

We are certain that teachers do not generally understand this matter. They think of commercial furniture designs as they think of one another's problems. They fail to see that, while professional courtesy and established custom prompts the interchange of shop problems, the copying of commercial designs is a form of "piracy."

Wood.

707. Q.—What kind of wood is best for making drawing boards?

A.—White pine or bass. The former will not warp. The latter is cheaper.

Lacquer for Iron or Brass.

Q.—709. What is a good lacquer for finishing iron or brass?—A. W.

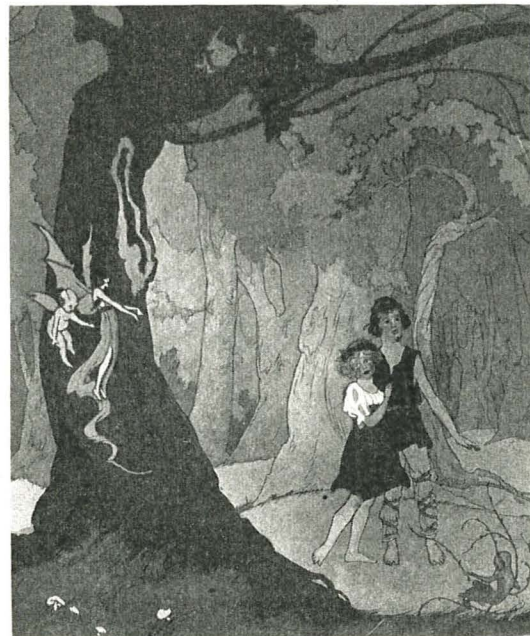
A.—Payne's "Art Metal Work" contains an excellent formula for lacquer to be used on copper or brass:

White shellac and grain alcohol mixed together in the proportion of 5 ounces of white shellac to 2 parts of grain alcohol. Allow the mixture to stand for 48 hours, strain thru a double thickness of cheesecloth and use.

This lacquer is not good for iron and steel.

The correspondent fails to state what kind of iron work he wants to lacquer. If the iron work is to be treated for outdoor use, it should be painted to prevent rust. If the iron is for indoor use it should be treated with some finish that will not destroy its texture as paint does.

A good method of finishing iron is to buff the high places bright. Then mix one part varnish in about four parts turpentine in a bottle and shake well. The mixture should be applied very thin with a piece of cloth. It will dry flat and will prevent rust. It will not destroy the character of the method as a paint or lacquer destroys it.—T. F. Googerty.



MURAL PANEL, ELM PLACE SCHOOL, CHICAGO.
Painted by Miss Gertrude Spaller.